UPPER GREEN RIVER WETLAND CORE COMPLEX

Regional Wetland Conservation Plan

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Final

Project Lead:
Susan Patla, Nongame Biologist
Wyoming Game and Fish Department
PO Box 67, Jackson, WY 83001
(307) 733-2321
susan.patla@wyo.gov

A regional step-down plan of the
Wyoming Wetlands Conservation Strategy

Prepared for the Wyoming Bird Habitat Conservation Partnership
(formerly Wyoming Joint Ventures Steering Committee)

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ACRONYMS AND ABBREVIATIONS

ACOE	Army Corps of Engineers
BHCA	Bird Habitat Conservation Area
BLM	United States Bureau of Land Management
BTNF	Bridger-Teton National Forest
DEQ	Wyoming Department of Environmental Quality
EPA	United States Environmental Protection Agency
GIS	Geographic Information Systems
GRBWC	Green River Basin Core Wetland Complex
GTNP	Grand Teton National Park
GYCC	Greater Yellowstone Coordinating Committee
IWSCP	Intermountain West Shorebird Conservation Plan
IWWCP	Intermountain West Waterbird Conservation Plan
NSS	Native Species Status, Wyoming State Wildlife Action Plan
NRCS	Natural Resources Conservation Services
NAWCA	North American Wetland Conservation Act
NAWCP	North American Waterbird Conservation Plan
NAWMP	North American Waterfowl Management Plan
NAWQA	North American Water Quality Assessment
NER	National Elk Refuge
NWI	National Wetlands Inventory
PIF	Partners in Flight North America
PIF – WY	Wyoming Partners in Flight Bird Conservation Plan
RMP	Resource Management Plan
SGCN	Species of Greatest Conservation Need
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SRWC	Snake River Wetland Complex (Jackson)
SRV	Snake River Valley (near Jackson, Wyoming)
SWAP	Wyoming State Wildlife Action Plan
TCF	The Conservation Fund
TNC	The Nature Conservancy
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WGFD	Wyoming Game and Fish Department
WJVSC	Wyoming Joint Ventures Steering Committee
WWDC	Wyoming Water Development Commission
WWNRT	Wyoming Wildlife and Natural Resources Trust
WWS	Wyoming Wetlands Society

INTRODUCTION

The Green River Basin Wetland Complex (GRBWC) near Pinedale is 1 of 9 priority wetland complexes identified in Wyoming. Wetland conservation efforts supported by the WY Bird Habitat Conservation Partnership (WHBCP) will be focused in these priority complexes over the next 10-year planning horizon (Figs. 1A & 1B) (WJVSC 2010). Copeland et al. (2010) identified over 30 wetland complexes with high species diversity scores throughout the state. Among these, the GRBWC contains the largest total area of wetlands (> 174,000 ac). This complex also has the largest number of rare species documented, and ranks second in overall wildlife diversity with 47 Species of Greatest Conservation Need (SGCN) (WGFD 2010, WJVSC 2010). The GRBWC ranks high both in resource vulnerability and project opportunity. This regional wetland plan describes local and regional wetland and riparian resources, and related conservation work. It also identifies project opportunities and conservation strategies adapted to address specific threats and opportunities unique to the Green River Basin Wetland complex. The goal is to expand capacity to identify, develop and fund wetland and riparian conservation projects throughout the GRBWC.

The exterior boundary of the Green River Basin wetland complex also encompasses the Big Sandy drainage from the Green River corridor east to Farson, and the Hams Fork and Blacks Fork Rivers west of the Green River corridor (Copeland et al. 2010) (Fig. 1B). However, this plan focuses on a smaller core area (47% of the original complex) along the Green and New Fork Rivers and their tributaries, extending from the southern border of Seedskadee National Wildlife Refuge (SNWR) to the upper end of the basin north of Pinedale (Figs. 2, 3). This was also the planning area (3,300 mi^2) selected for a 2012 NAWCA (North American Wetland Conservation Act) standard grant proposal developed by the Wyoming Game and Fish Department (WGFD), The Conservation Fund (TCF), and 9 other partners (USFWS 2012b). The core area also includes a broader area of sagebrush-steppe and other upland habitats adjacent to the major river corridors and stream tributaries, which were not within the original wetland complex boundaries delineated by Copeland et al (2010 – Fig. 1B). It is important to incorporate these additional upland habitats into the planning area because healthy upland habitats are essential to maintain properly functioning riparian/wetland habitats. The ecological health of the entire watershed is critical, of course, for maintaining and conserving high quality wetland and riparian habitats and a diversity of wildlife species.

GENERAL DESCRIPTION AND LAND USE

The Wyoming portion of the Green River Basin encompasses 17,149 mi^2, bordered on the east by the Continental Divide (including the Wind River Range), the Gros Ventre Range to the northwest, the Wyoming Range and the Tunp Range to the west, and the Wyoming state border to the south (States West 2001, WWC Engineering 2010) (Fig. 3).

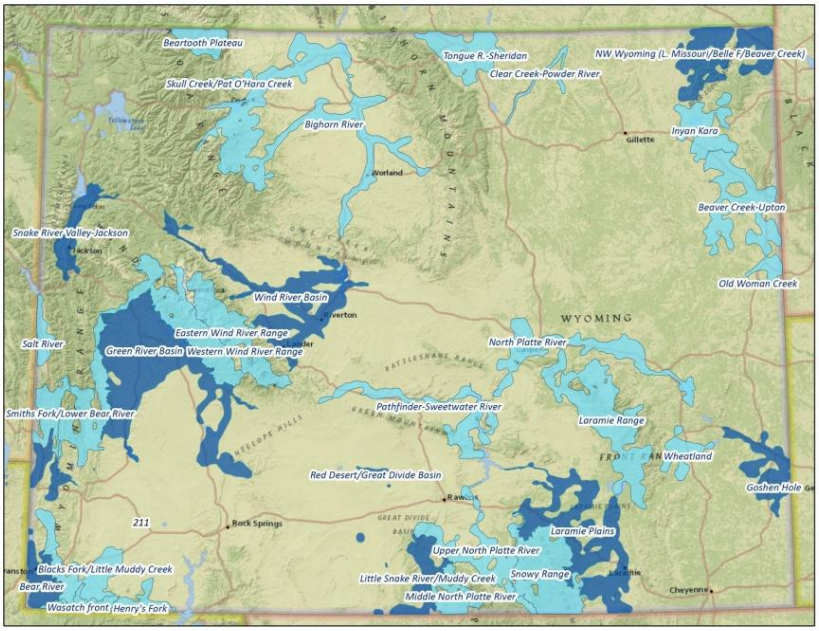

Fig. 1A. Map of 31 priority wetland complexes in Wyoming including 9 primary focus areas (dark blue – WJVSC 2010).

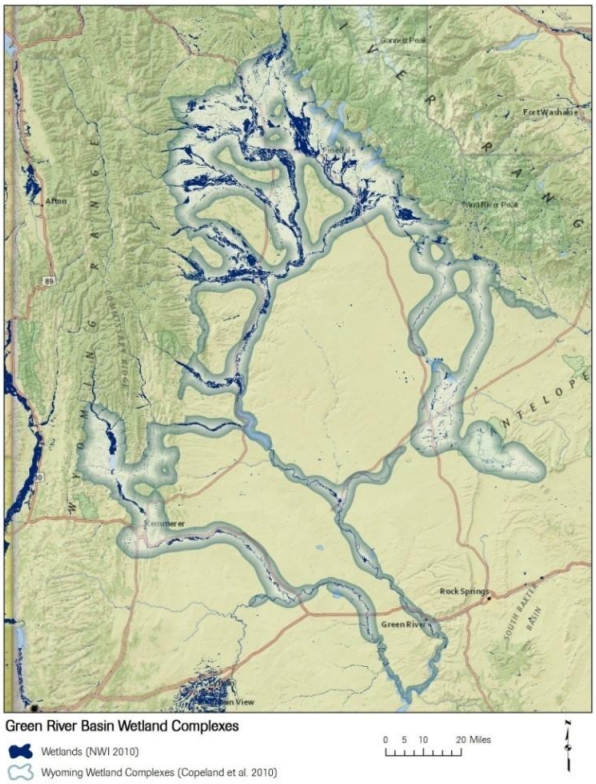

Fig. 1B. Map of the Green River Basin Wetland Complex (Copeland et al. 2010).

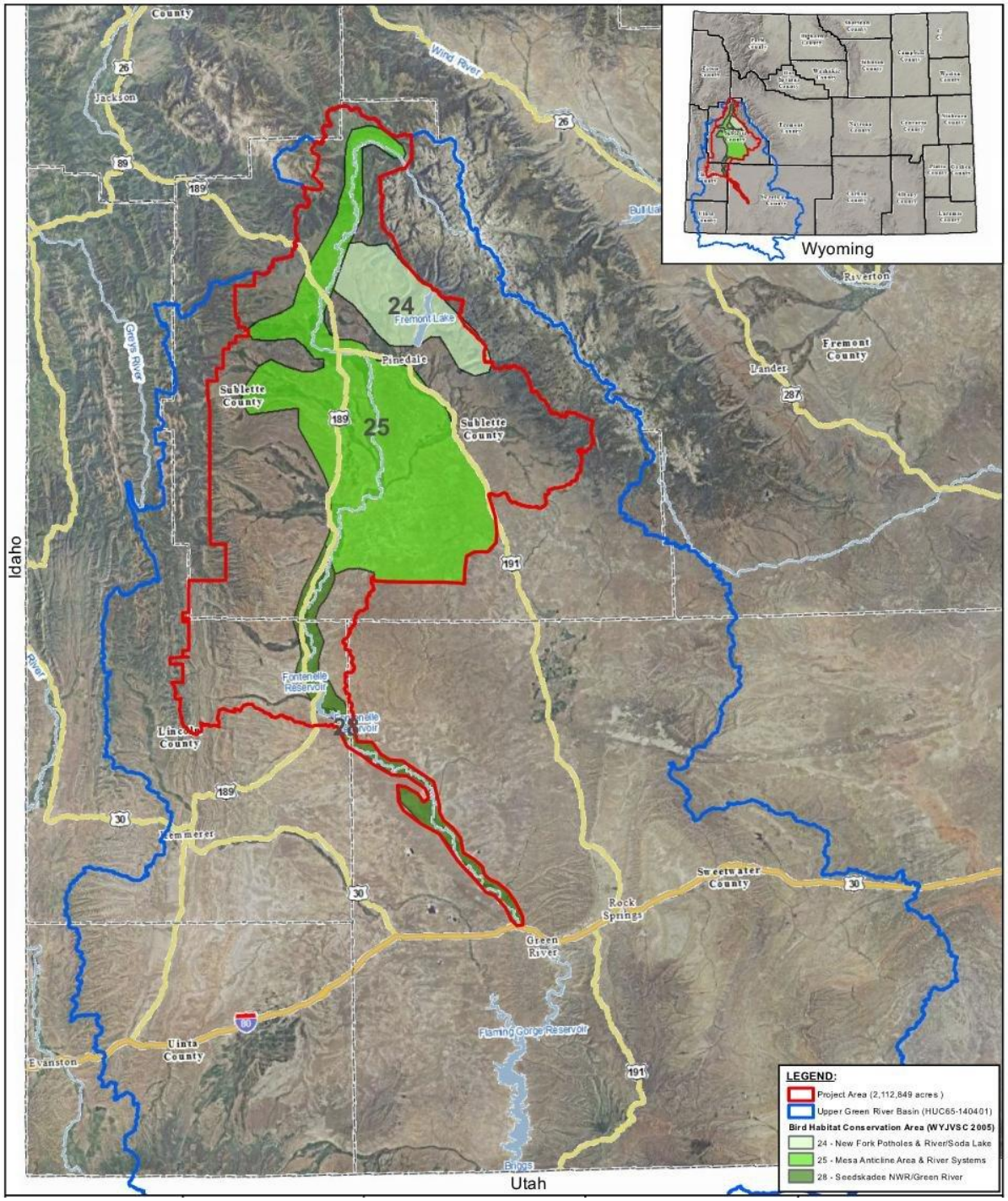

Fig. 2. Map of the core Green River Basin Wetland Complex (outlined in red) within the Upper Green River Basin (outlined in blue). Two state-designated Bird Habitat Conservation Areas are highlighted in green.

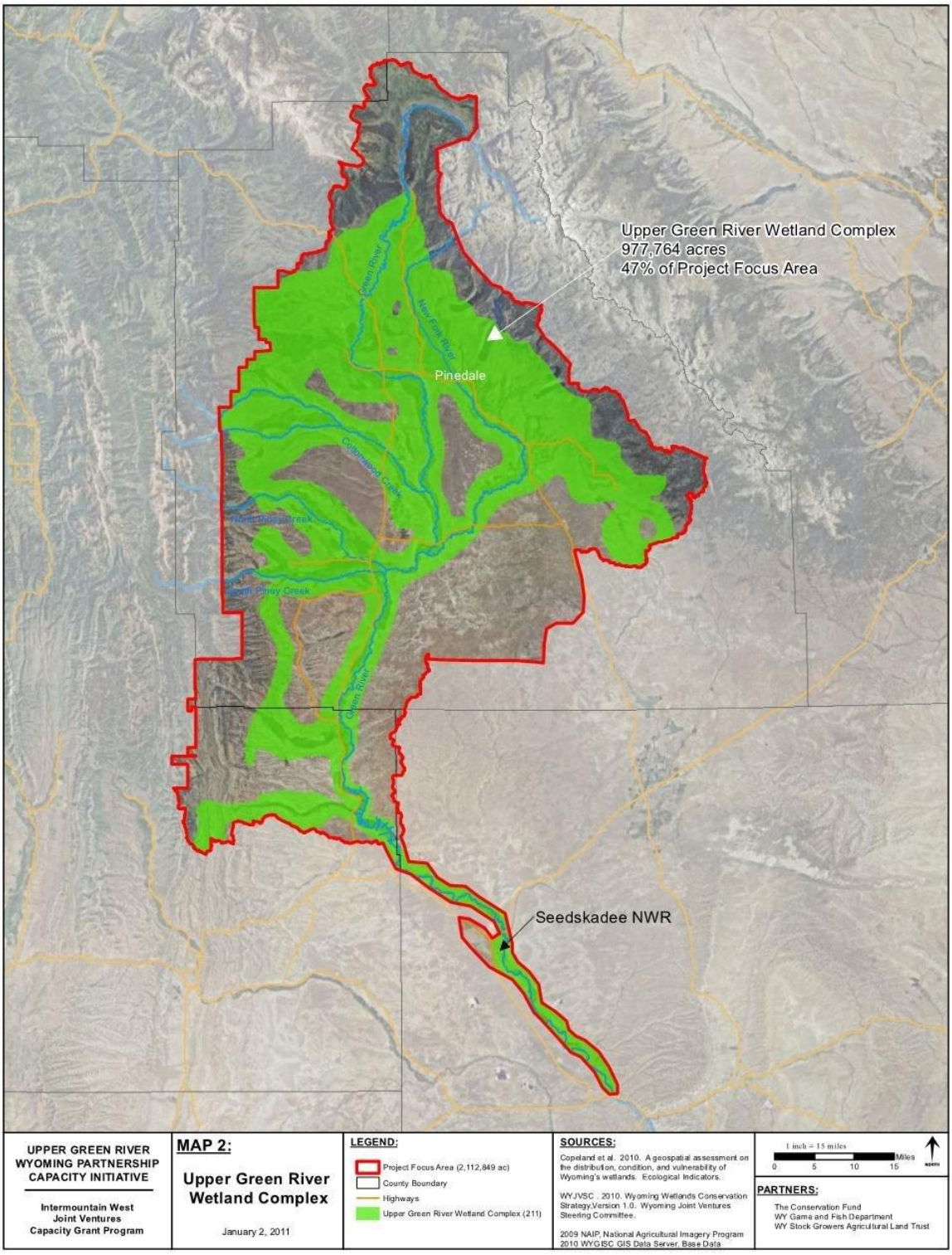

Fig. 3. Map of the core Green River Basin Wetland Complex (outlined in red) with the wetland complex delineated by TNC (2010) shown in green.

Ecosystems throughout the basin are remarkably diverse, ranging from high mountain peaks and alpine tundra to high elevation desert with extensive ribbons of riparian habitat along the Green River and its tributaries. The basin is recognized worldwide for its diverse wildlife and waterfowl populations. Writer and naturalist Ann Zwinger characterized the landscape and its history in a travel narrative describing a float trip down the Green River (Zwinger 1975). Wetland habitats in this glacially formed valley consist of oxbows, sloughs, potholes, irrigated wet meadows, reservoirs, and springs that provide habitat for a multitude of avian and other wildlife species (Copeland et al. 2010). Historic land uses were predominantly agriculture and recreation; however, the area also contains nationally significant energy reserves. Rapid and increasing energy development has ignited a great deal of conservation interest and concern in recent years.

Core Green River Basin Complex

The core Green River Basin Wetland Complex (GRBWC) includes portions of the upper Green River Basin below 8000 ft elevation. Most of the area lies within Sublette County although the southern portion extends into Lincoln and Sweetwater Counties where it includes Fontenelle Reservoir and Seedskadee NWR (Fig. 3). Land ownership is: BLM (49.7% – 1,051,358 ac), private (30.6% – 626,317 ac), US Forest Service (12.6% – 266,845 ac), State (4.6% – 98,139 ac), Bureau of Reclamation (1.4% – 30,060 ac), and US Fish and Wildlife Service (1.1% – 22,657 ac) (Fig. 4). The Pinedale Area Resource Management Plan (RMP – USDA BLM 2008), encompasses most of the wetland complex. The BLM manages activities on BLM-administered surface lands as well as leasing and development of BLM-administered mineral estates that underlie nonfederal lands (USDA BLM 2008). The RMP provides detailed information about natural, cultural, and recreational resources throughout the area.

The climate is identified as "Southern Rocky Mountain Steppe" – a temperate semiarid regime with average annual temperatures ranging from 35-45^{o}F, but reaching 50^{o}F in the lower elevations. The mean maximum summer temperature in Big Piney is 76 ^{o}F and the mean minimum winter temperature is 3 ^{o}F (See website Western Regional Climate Center: http://www.wrcc.dri.edu/). The mean annual precipitation in Big Piney ranges from 5" in dry years to 12" in wet years. The majority of rainfall occurs as short, intense storms. Higher elevations receive substantially greater amounts of precipitation (40-60"), mostly as snowfall. Much of the annual flow in the larger streams derives from mountain snowmelt.

Approximately 600,000 ac of Sublette County is under agricultural use, with the primary focus on livestock (cattle operations) (USDA 2007 Agricultural Census accessible at: http://www.agcensus.usda.gov/index.php). The Pinedale BLM office administers 219 allotments including 197 used for cattle grazing and 16 for horse grazing. Several BLM allotments (73) are small, scattered acreages, within larger tracts of private and state land. Agricultural areas, including irrigated and dryland crops, cover 284,132 acres (17.5%) of the RMP area. Most of the agricultural area consists of irrigated hay meadows. Some dryland crops (5,283 ac) are grown in upland areas . Crops grown on private land are dominated by grass hay, such as Garrison creeping foxtail, timothy,

and smooth brome, with a few fields of alfalfa throughout the area. Most of the forage produced is used to feed the producers' herds. Irrigated acres along the main stem of the Green River down to Fontenelle Creek total over 133,000 ac and along the New Fork River almost 53,000 ac (States West 2001).

The Green River area is a popular destination for outdoor recreation. Recent increases in recreation use present challenges for land managers who need to accommodate recreational demands while protecting natural resources (USDA BLM 2008). Recreational activities include hunting, fishing, boating, camping, hiking, OHV use (summer and winter), wildlife viewing and sightseeing among others. Float fishing and wade fishing are very popular activities along the major river corridors. The WGFD has developed many new public access areas along the Green and New Fork Rivers to accommodate recreational users (see http://gf.state.wy.us/accessto/access.asp).

Conservation Easements

Approximately 98,071 ac (16%) of the private lands within the GRBWC are protected by perpetual conservation easements (Fig. 4). Organizations managing these easements include Wyoming Stock Growers Association Land Trust, Wyoming Game and Fish Commission, Jackson Hole Land Trust, The Conservation Fund, and The Nature Conservancy. The Wyoming Land Trust (formerly Green River Land Trust) which held 58 easements has ceased operation and is in the process of transferring its easements to other land trust groups.

Conservation easements place various constraints on the forms of development, land use, and management allowed on private lands under contract. Wetland and riparian habitats are commonly the focus of conserved lands, the majority of which are along major river corridors and their tributaries. The NAWCA standard grant awarded in 2012 will help secure an additional 36,266 acres of perpetual conservation easements.

Ecological Cover Types

Habitat types within the GRBWC include sagebrush-steppe (48%), wetland habitats (15%) and riparian habitats (1%) (Fig. 5). Dominant sagebrush species are Wyoming Big Sagebrush (*Artemisia tridentata var. wyomingensis*) and Mountain Big Sagebrush (*Artemisia tridentata var vaseyana)*. Common understory plants include rabbitbrush (*Chrysanthemum* sp) needlegrass (*Stipa* sp), wheatgrass (*Agropyron* sp), bluegrass species (*Poa* sp.), phlox (*Phlox* sp.), buckwheat (*Eriogonum sp*.), and fescue (*Festuca sp*.). Salt desert shrub communities prevail on soils with high sodium content and are dominated by Gardner saltbush (*Atriplex gardneri*) and greasewood (*Sarcobatus*). Lower elevation woodland plant species including aspen (*Populas tremuloides*), cottonwood (*Populas sp.*), and willow (*Salix sp*.) often dominate in mesic sites along perennial or intermittent drainages, seeps and springs. A diversity of wetland plants (obligate and facultative) occur in wetland and riparian areas with hydric soils. Maps depicting riparian zones are available through

the Wyoming Geographic Information Science Center (WYGISC 2009).

The BLM has identified several sensitive plants including Ute Ladies' Tressess)(*Spiranthes diluvialis*) listed as threatened under the ESA, and other regionally rare or imperiled plants within the RMP (USDA BLM 2008). At least 16 state designated noxious weeds have also been documented.

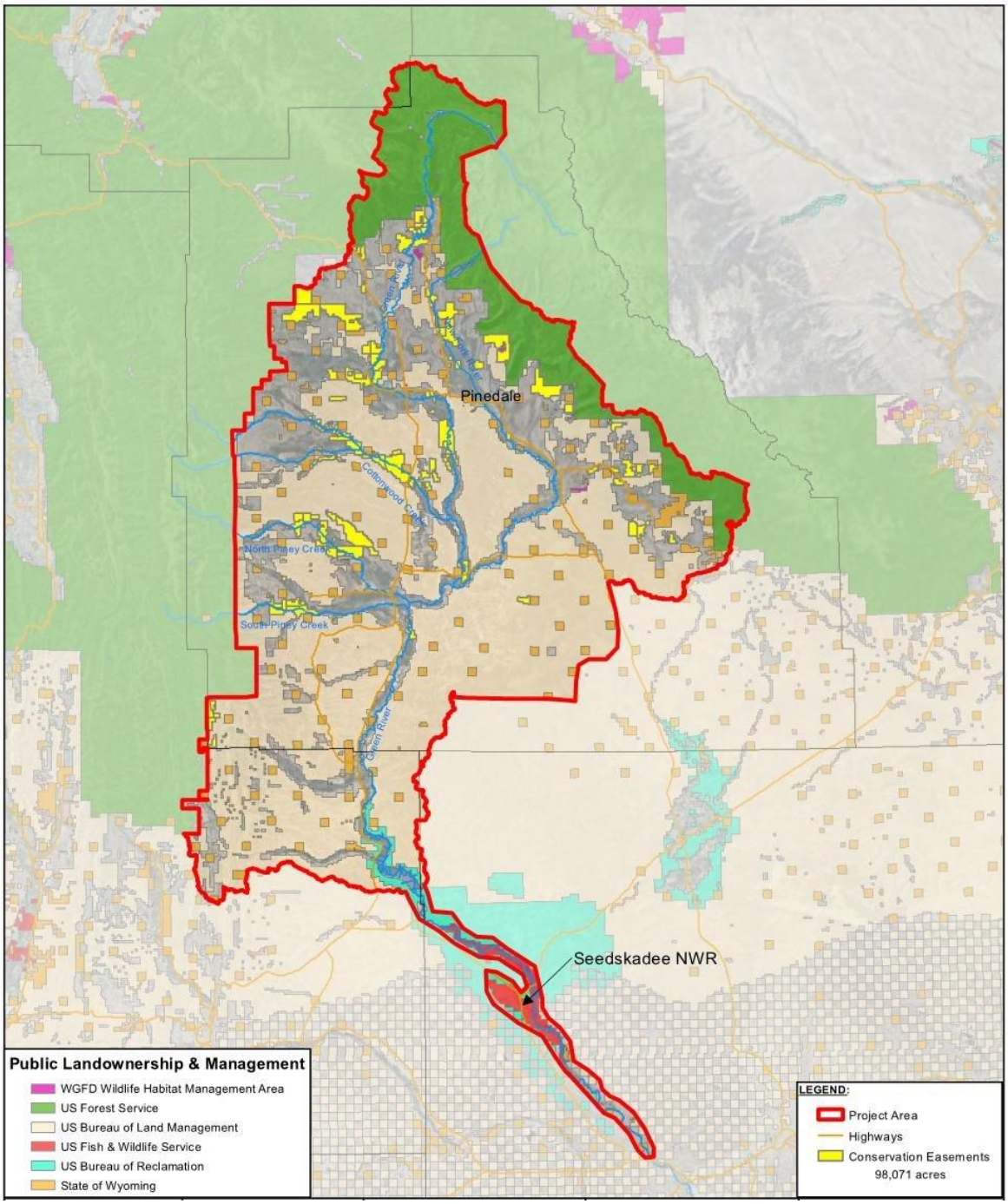

Fig. 4. Land ownership within the core Green River Wetland Complex showing over 98,000 acres (yellow) protected under conservation easements.

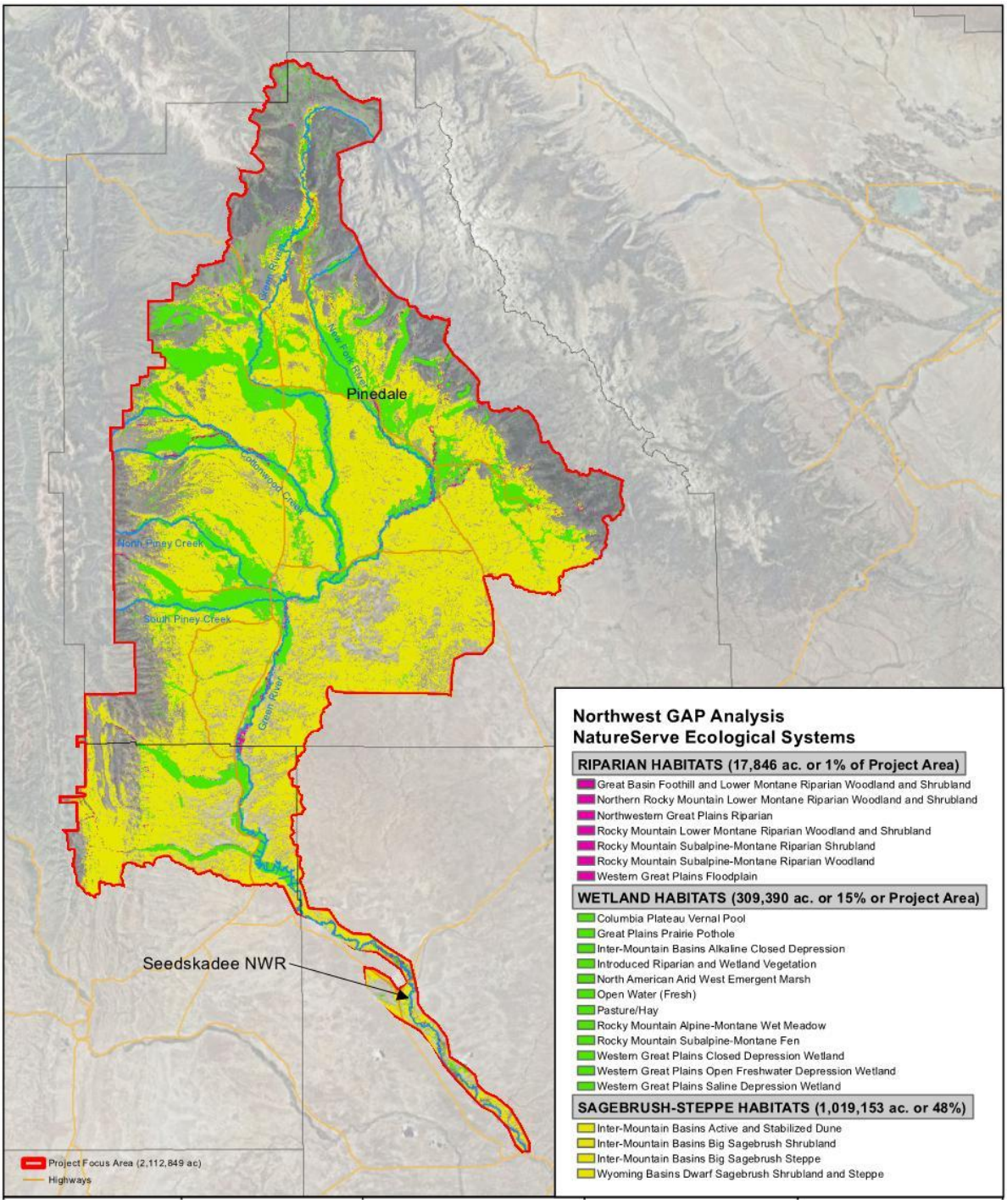

Fig. 5. Ecological cover types in the core Green River Wetland Complex area (based on Northwest GAP Analysis – University of Idaho: http://gap.uidaho.edu/index.php/nw-gap).

Hydrology

The Green River originates in the Wind River Range and flows south to Fontenelle Reservoir (USDA BLM 2008, Zwinger 1997). After emerging from Fontenelle Dam, the river continues south through Seedskadee NWR, eventually entering Flaming Gorge Reservoir on the Wyoming/Colorado border. A major tributary, the New Fork River, drains much of the western aspect of the Wind River Range and flows southwesterly to its confluence with the Green River near Big Piney. Both the Green and New Fork Rivers have formed alluvial valleys of varying width throughout much of their length. The State of Wyoming has designated the Green River a Class 1 water north of its confluence with the New Fork River. Class 1 waters are defined as "outstanding waters" in which no further degradation by point source discharges, other than from dams, will be allowed (WDEQ 2001). Tributaries that drain the area west of the Green River include Beaver, Horse, Cottonwood, Dry Piney, Piney, LaBarge and Fontenelle creeks, all of which arise from the east face of the Wyoming Range. A number of shorter creeks drain from the Gros Ventre and Wind River ranges into the upper Green River.

The Green River is a major tributary of the Colorado River. The Colorado River Basin is second largest river basin in the US. Interstate water allocations are managed under the Colorado River Basin Compact (1922) and the Upper Colorado River Compact (1948). Wyoming's developable water is estimated at between 728,000 and 938,000 acre-feet per year (States West 2001). The Green River Basin Water Planning Process Report provides extensive details on available surface and ground water in the basin (States West 2001). Eight major aquifer systems have been identified in the area of the GRBWC (USDA BLM 2008). Groundwater is primarily used for municipal and industrial (oil and gas drilling) purposes. Surface water rights have been established by the Wyoming constitution and in accordance with the doctrine of prior appropriation. Water rights are considered property rights and can be transferred in use or location after review by the State's Engineer's Office or Board of Control. Adjustments such as priority date, quantity, and season of use may be made to address impacts to other users and account for conveyance losses between locations.

Wetlands and other Water Resources

The formation and locations of wetlands within the GRBWC were influenced primarily by past glacial and riverine processes. These wetland habitats have undoubtedly changed in significant but undetermined ways as a result of extensive beaver trapping starting in 1824, followed in the mid to late 1800s by establishment of irrigation and water developments to support agriculture on lower elevation lands.

Approximately, 172,938 acres of palustrine wetlands have been mapped by the National Wetlands Inventory (NWI) effort within the GRBWC. Based on the classification system of Cowardin et al. (1979), this total includes 138,701 acres of freshwater emergent wetlands, 30,578 acres of palustrine forested/shrub wetlands, and 3,659 acres of freshwater ponds/aquatic beds. Common wetland types within the GRBWC are summarized in Table 1. These wetland habitats include oxbows, sloughs,

potholes, irrigated wet meadows, reservoirs, and springs that provide habitat for a multitude of avian and other wildlife species (Copeland et al. 2010).

Table 1. NWI wetlands within the GRBWC.

System Level	Class Level	Geomorphology	Water Source	Hydroperiod
Riverine (associated with flowing water)				
(7,648 ac.)	Emergent	stable shorelines, flood channels, oxbows	channel flow, overbank flow	seasonal
	Unconsolidated Shore	braided channels, coarse substrate	channel flow, overbank flow	seasonal
Palustrine (small without flowing water, includes ponds)				
(72,938 ac.)	Aquatic Bed	depressions, potholes, sloughs	groundwater, precipitation, seeps, springs	seasonal, perennial
	Emergent	depressions, potholes, sloughs	groundwater, precipitation, seeps, springs, flood irrigation	seasonal
	Forested/Shrub	floodplains, Depressions	groundwater, precipitation, seeps, springs	seasonal
Lacustrine (larger and lakelike, includes deepwater aquatic habitats, e.g. Fremont Lake)				
(22,808 ac.)	Aquatic Bed & Unconsolidated bottom	glacial scour & end moraines	streams, groundwater	perennial
	Emergent	fine substrate (shoreline fringe)	overbank flow	perennial, seasonal
	Unconsolidated Shore	coarse substrate	waterbody	perennial, seasonal

The majority of emergent wetlands are irrigated meadows that are seasonally flooded. Irrigated lands within the GRBWC total 188,000 acres (Fig. 6). An EPA-funded wetland condition assessment, initiated in 2012, revealed the NWI maps for this area can be inaccurate (H. Copeland, TNC, pers. comm.). Some areas mapped as wetlands held few if any wetland characteristics (H. Copeland, TNC, pers. comm.). Also, the NWI maps failed to document small patches of productive wetland habitat such as depressions and seepage areas associated with irrigated pastures and margins of storage reservoirs that are valuable for a variety of wildlife.

The New Fork Potholes is a unique wetland feature located along the front of the Wind River Range in the GRBWC. Nearly 100 potholes were formed by melting blocks of glacial ice stranded in

a field of glacial outwash (USDA BLM 2008). These types of wetlands are rare in the Rocky Mountain region. They provide abundant habitat for waterfowl, waterbirds, and Neotropical migratory birds as well as moose, elk, deer and other terrestrial wildlife. Pairs of trumpeter swans (*Cygnus buccinator*) have nested there and the nesting density of diving ducks is the highest in the state (WGFD 2009a).

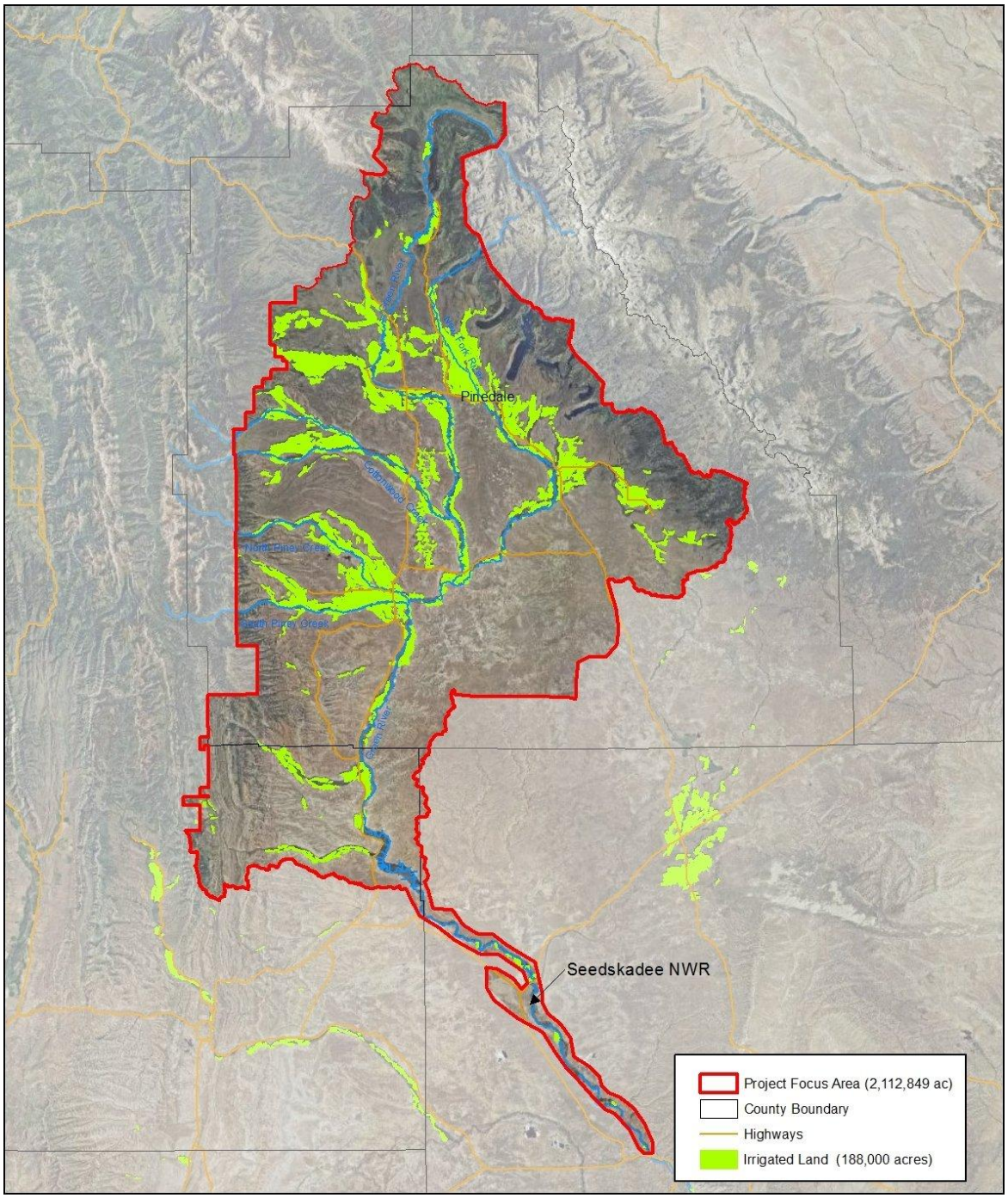

Fig. 6. Irrigated lands within the Green River Basin Core Wetland Complex.

The GRBWC contains an abundance of natural lakes and man-made reservoirs. Several of the lower elevation lakes were created by glacial flow and deposits along the front of the Wind River Range north of Pinedale. Most are located on Forest Service Land. These very deep, cold oligotrophic lakes afford minimal habitat for waterfowl. Several larger reservoirs were also built to store water for irrigation, municipal, industrial and recreation use, and for flood control (Table 2). Some provide excellent habitat for migrating waterfowl, especially in spring and late fall when water levels are drawn down, exposing extensive areas of shallow foraging habitat. Fontenelle, Sixty Seven, and the McNitch Reservoirs are especially outstanding in this regard (WGFD records). Reservoir information is summarized in the WWDC Green River Basin Water Plan 2010 Technical Memoranda: http://waterplan.state.wy.us/plan/green/techmemos/reservoir_hires.pdf. Historic data and current conditions at Fontenelle Reservoir are available from the Fontenelle Working Group (BOR Colorado River Storage Project): http://www.usbr.gov/uc/water/crsp/wg/ft/ftcurrnt.html.

Table 2. Large reservoirs within the Green River Basin Core Wetland Complex.

Reservoir Name	Surface Area (at capacity)	Capacity (Acre-ft)	Uses
Fontenelle	8,058 ac	345,397	Power generation, fisheries, waterfowl, recreation
Fremont Lake	5,122 ac	30,899	Municipal water, irrigation, recreation, fisheries
McNitch No. 1	108 ac	1,086	Irrigation storage, stock, waterfowl
McNitch No. 2	26 ac	198	Irrigation storage, stock, waterfowl
New Fork Lake	1,416	20,340	Irrigation, recreation, fisheries
Sixty-Seven	333	5,211	Irrigation storage, stock, waterfowl
Willow Lake	1,958	18,816	Irrigation storage, stock, fisheries

Managed Wetlands

Seedskadee National Wildlife Refuge contains the most extensive area of managed wetlands in the GRBWC (USFWS 2002). Descriptions of management units on the refuge follow.

Hamp Wetland Unit: The 60-acre Hamp unit contains a wetland complex consisting of short emergent, tall emergent and open water habitats influenced largely by topography. The unit is fed by gravity flows through the Hamp No. 1 headgate. River flows of ≥2,000 cfs are adequate to maintain most of the unit at full pool. Depths, at full pool, range from 0.3-1.25 m. Vegetation is dominated by creeping foxtail (*Alopecurus arundinaceus*) and perennial pepperweed (*Lepidium sp*.). Patches of softstem bulrush (*Schoenoplectus tabernaemontani*) and spikerush (*Elocaris sp*.) grow along the margins. Submersed aquatic vegetation is generally lacking except in the ditches. The unit contains a number of dikes with drop-board water control structures to adjust inflow and outflow. However, the water delivery system is not set up to manage individual pools separately. A pair of trumpeter swans has successfully nested there in some years.

Hawley, Lower Hawley, and Dunkle Wetland Units: The Hawley (30 acres), Lower Hawley (150 acres) and Dunkle (40 acres) wetland units each contain a complex of short emergent, tall emergent and open water habitats. The composition and distribution of plant cover within each of these units is also determined largely by the topographic variations in the substrate. Water flows by gravity through Hamp No. 2 headgate into the Hawley unit first, then into the Lower Hawley and Dunkle units. Vegetation in each wetland unit is comprised of a diverse mix of short emergent plants, tall emergents and submergents. Open water areas throughout the Hawley unit support dense growth of submersed plants. Open water areas are present next to dikes in the Lower Hawley and Dunkle units, and sustain limited aquatic plant growth. All wetlands contain a number of dikes with drop-board water control structures. However, management of sub-unit pools is difficult due to the layout of the water delivery system. The best opportunity for managing subunit pools exists in the Hawley unit. This unit also contains the highest density of nesting trumpeter swans (up to 5 pairs) in the state.

Pal Wetland Unit: The 80-acre Pal Unit contains a diverse mix of short emergent and tall emergent vegetation, but has little open water. Flow feeds into the unit at the Superior headgate via the Superior Ditch system. No dikes were built within the unit. Water flows over low depressions (3 small pools and 1 old river oxbow) creating a wet meadow habitat. Vegetation is a mix of short emergent and tall emergent plants. Water levels in the unit drop as river level recedes.

Private Land Wetlands

Wetland projects in the GRBWC have been planned and constructed on private lands through Wyoming Game and Fish Department's trumpeter swan Summer Habitat Project, FWS Partners for Fish and Wildlife Program (PFW), and Natural Resources Conservation Services (NRCS) programs including the Wetlands Reserve Program (WRP), Wildlife Habitat Incentives Program (WHIP), and Environmental Quality Incentives Program (EQIP). Since 2007, the WGFD has built over 40 acres of shallow ponds on 4 ranches to provide nesting habitat for trumpeter swans and other waterfowl (Patla 2011). Funding for these projects was provided primarily through the Wyoming Landscape Conservation Initiative (WLCI) and Wyoming Wildlife and Natural Resource Trust (WWNRT). The NRCS Pinedale office has provided funding and technical assistance to construct over 50 acres of wetland

habitat on 11 wetland projects since 1998 (J. Hayward, NRCS Pinedale, pers. comm.). PFW has become more active in the GRBWC area since an office was established in Evanston, WY in 2010. This program has created, restored, or enhanced 58 acres of wetlands and an additional 50 acres of projects are planned (Dave Kimball, PFW, pers. comm.). Private contractors have also built an undetermined number of deep ponds to support fish on private lands throughout the area. A number of small ranch reservoirs were built historically to supply water for livestock, irrigation, and fish habitat. Depending on size and depth, these small reservoirs can be very valuable for waterfowl nesting, brood rearing and seasonal habitat.

Riparian Areas

Approximately 17,846 ac of riparian habitat are interspersed throughout the GRBWC (Fig. 5). Riparian forests typically consist of narrowleaf cottonwood (*Populous angustifolia*) and willows (Salix spp.) along floodplains of the Green and New Fork Rivers and their tributaries. Principal shrub species include Woods' rose (*Rosa woodsii*), silver buffaloberry (*Shepherdia argentea)*, silverberry (*Elaeagnus commutata)*, skunkbush sumac (*Rhus trilobata*), golden currant (*Ribes aureum*)and gooseberry (*Ribes montigenum*).

Seedskadee NWR contains the largest area of riparian habitat on public lands – approximately 4,349 acres of forest and shrub-dominated riparian habitat. However, the construction of Fontenelle Dam in the early 1960s eliminated natural flow regimes essential for seedling recruitment and vigor of cottonwood forests and riparian shrub communities (USFWS 2002). Grazing by native ungulates is also impacting regeneration of riparian vegetation. A large-scale project is currently underway to restore cottonwood habitat on the refuge. A NAWCA standard grant approved in 2012 includes $100,000 for riparian restoration at the refuge.

WILDLIFE ASSOCIATED WITH WETLAND AND RIPARIAN HABITAT

The importance of riparian and wetland habitats in the arid, high elevation basins of Wyoming cannot be overstated. About 90% of Wyoming's wildlife use wetland habitats daily or seasonally during their life cycles, and 70% of Wyoming's birds are considered wetland obligates (WGFD 2003). Mesic habitats such as sedge marshes, willow bottoms, cottonwood forests, and irrigated fields provide critical foraging, nesting, roosting, and resting habitats for scores of species during breeding, migration and winter periods.

Species of Greatest Conservation Concern (SGCN) designated in Wyoming warrant increased management attention, conservation funding, and consideration in project planning (WGFD 2010). SGCN affiliated with wetland and riparian habitats in the GRBWC include 34 bird species designated Native Species Status (NSS), Priorities I-IV (Table 3) as well as 6 mammal, 4 fish and 3 amphibian species (Table 4). In addition, 75 species of waterfowl and waterbirds (Table 5), and dozens of more common bird and mammal species frequent wetlands within the basin (WGFD 2012).

Developing wetland project proposals, especially those that seek funding through the National Wetlands Conservation Act (NAWCA), requires familiarity with the numerous bird conservation plans

listed in the *Coordinated Implementation Plan for Bird Conservation in Wyoming* (IMJV 2005). Bird species covered by the various plans are identified in Table 3. In addition, the Wyoming Bird Conservation Plan (WGFD 2003) provides specific information on bird species that use wetland and riparian habitats, current risks to those habitats, and best management practices to benefit birds in Wyoming. The IWJV Wyoming Steering Committee identified Bird Habitat Conservation Areas (BHCAs) including two within the GRBWC (Fig. 2). These BHCAs delineate areas with the best remaining opportunities for effective bird conservation projects. A brief discussion of key wildlife species within the GRBWC follows.

BIRDS

Raptors

Raptor SGCN nesting within or near riparian habitats in the GRBWC include Bald Eagle (*Haliaeetus leucocephalus)*, Swainson's Hawk (*Buteo swainsoni)*, Merlin (*Falco columbarius)*, Prairie Falcon (*Falco mexicanus*) and Peregrine Falcon (*Falco peregrinus*). Short-eared Owls (*Asio flammeus*) nest in grassland and shrub-steppe habitats, but often forage in wet meadows. The concentration of prey along river and stream corridors is extremely important for raptors.

Bald Eagle: Highest densities of nesting bald eagles in Wyoming occur in Teton, Sublette and Carbon counties. Bald eagler numbers have steadily increased since the 1980s. In the Green River drainage, recovery of this species first occurred at Seedskadee NWR where currently 8-12 pairs nest annually. Over the past 15 years, WGFD biologists have documented establishment of over 25 additional nest sites along the Green and New Fork River drainages as well as some off-river sites from north of Seedskadee NWR to the Green River Lakes. Numbers of Bald Eagles peak in fall when hundreds pass through on migration from northern Canada to more southerly wintering habitats (WGFD records).

The loss of large cottonwoods and other trees along river corridors could limit suitable nesting habitat in the future. Additional conservation concerns include disturbance from energy development, contaminates, increasing recreational activity, persistence of native fish, and diseases such as West Nile (Harmata 1992, WGFD 2010).

Craighead Beringia South Wildlife Institute and WGFD are currently conducting a study of resident Bald Eagles in the Anticline Natural Gas Field Project area south of Pinedale to assess habitat use and response to energy development. This satellite telemetry project is funded by the Pinedale Anticline Project Office (PAPO). Refer to: http://beringiasouth.org/bald-eagles-and-energy-development.

Waterfowl

On a continental scale, the Green River Basin is not considered a major waterfowl concentration area. However the aquatic and wetland habitats of the basin provide regionally important nesting, migration stopover, and winter habitat. The GRBWC is also near 2 areas of continental significance identified in the North American Waterfowl Management Plan: Yellowstone-Intermountain Wetlands (80 miles NW) and the Great Salt Lake/Bear River Marshes (160 miles SW). At least 25 species of ducks and

geese have been documented in the Green River basin and 21 are known to breed there (WGFD 2012). Shallow ponds, creeks, and associated marshy habitats are used by most species of dabbling ducks and geese, while diving ducks such as goldeneye and mergansers frequent the swifter currents of the major river corridors. Trumpeter swan, northern pintail (*Anas acuta)*, canvasback, redhead (*Aythya americana)*, Barrow's goldeneye (*Bucephala islandica)*, harlequin duck (*Histrionicus histrionicus*) and lesser scaup (*Aythya affinis*) are classified as SGCN in Wyoming (Table 3).

The WGFD has conducted the following waterfowl surveys annually within the Green River watershed in Wyoming: goose breeding pairs counts in April; molting geese surveys at concentration areas every three years in July; mid-winter survey (collected concurrently with the trumpeter swan winter survey in early February); and duck breeding pair counts within defined count blocks (through 1999 only – see next paragraph). The molting goose survey was discontinued beginning in 2013. The midwinter waterfowl survey and April breeding goose survey are also being discontinued after 2013, as Wyoming is no longer an active participant in the Pacific Flyway and these data have minimal consequence for management. The average estimates of Canada goose (*Branta canadensis)* breeding pairs on the Upper Green River (Kendall Bridge south to Fontenelle Reservoir) and Lower Green River (Fontenelle Dam to Flaming Gorge Reservoir) were 138 and 254, respectively (WGFD data, 2002-2011). The number of molting Canada geese counted on Sixty-Seven Reservoir and McNitch Reservoir #1 ranged from 576-906 during 1996-2005 (WGFD records).

The WGFD conducted aerial surveys of breeding waterfowl in 58 survey blocks from 1955-1999 (WGFD 2009). Three survey blocks in the Green River drainage included New Fork potholes (#51-12 mi^2), Big Piney (#52-26 mi^2), and Big Island (#54-58 mi^2). The New Fork potholes had the second highest average indicated breeding pair density (AIBPD) of ducks in the state (29.8/m^2), including the fourth highest AIBPD of dabbling ducks (11.0 m^2), and the highest AIBPD of diving ducks (18.4/ m^2). Big Island had the 10^{th} highest AIBPD of ducks (8.4/ m^2), including the fifth highest AIBPD of diving ducks (1.7/ m^2). Big Piney had the 10^{th} highest AIBPD of diving ducks (0.7/ m^2). (Data from past breeding waterfowl surveys are summarized in WGFD 2009).

The only habitat capable of sustaining waterfowl during winter in the GRBWC is a 10-30 mile stretch of the Green River below Fontenelle Dam, which remains open throughout the winter. Limited patches of open water persist in a few scattered areas along the New Fork River south of Pinedale and on Forty Rod Creek near Daniel due to influx of spring-fed water. WGFD has conducted an annual mid-winter waterfowl survey in conjunction with the coordinated winter survey of trumpeter swan in the Tri-state Area. In 2012, WGFD counted 230 trumpeter swans, 128 Canada geese, 386 mallard (*Anas platyrhynchos),* 715 goldeneyes (does not distinguish between Barrow's and Common [*Bucephala clangula]*), and 195 common mergansers (*Mergus merganser)*, along with smaller numbers of other species such as bufflehead (*Bucephala albeola)*, gadwall (*Anas strepera)*, and green-winged teal (*Anas crecca*) (WGFD records). During 2001-2012, annual counts from Warren Bridge to Flaming Gorge Reservoir averaged over 2,300 waterfowl including 343 Canada geese, 407 mallards, and 866 goldeneyes.

TABLE 3. BIRD SPECIES OF GREATEST CONSERVATION NEED (SGCN) (NSS I-IV) ASSOCIATED WITH WETLAND, RIPARIAN, AQUATIC OR ASSOCIATED UPLAND HABITATS IN THE GREEN RIVER BASIN CORE WETLAND COMPLEX (WGFD 2010). FOR EXPLANATION OF STATE RANKING CRITERIA SEE: HTTP://WGFD.WYO.GOV/WEB2011/DEPARTMENTS/WILDLIFE/PDFS/SWAP_SPECIESCONSERVATIONINTRO0002949.PDF

Native Species Status	Priority Tier	USFWS ESA or BCC	SPECIES	PRIMARY HABITAT	SECONDARY HABITAT	NAWCA - BCR10	PIF – PA86	PIF - WY	IWSCP	NAWCP	IWWCP	Seedskadee NWR list	Documented	
													BREEDING	MIGRATORY
NSS 1	I		**Common Loon**	Lakes, Reservoirs				II			X	X		X
NSS 2	I	BCC	**Bald Eagle**	Riparian	Coniferous Forest	X		I				X	X	X
NSS 2	I		**Greater Sage-grouse**	Shrub-steppe	Wet Meadows		X	I				X	X	
NSS U	I		**Burrowing Owl**	Shrub-steppe				I				X	X	X
NSS U	I	BCC	**Ferruginous Hawk**	Shrub-steppe	Riparian		X	I				X	X	X
NSS U	I		**Mountain Plover**				X							
NSS 2	II		**Trumpeter Swan**	Lakes, Rivers	Wetlands			I				X	X	X
NSS 3	II		**American Bittern**	Wetlands				I	X		X	X	X	X
NSS 3	II		**Barrow's Goldeneye**	Lakes, Rivers	Riparian							X	X	X
NSS 3	II		**Black Tern**	Wetlands	Lakes			I	X			X		X
NSS 3	II		**Black-crowned Night Heron**	Wetlands	Lakes, Riparian							X		X
NSS 3	II		**Canvasback**	Lakes, Rivers	Wetlands					X	X	X	X	X

Table 3 (Continued)

Native Species Status	Priority Tier	USFWS ESA or BCC	SPECIES	PRIMARY HABITAT	SECONDARY HABITAT	NAWCA - BCR10	PIF – PA86	PIF - WY	IWSCP	NAWCP	IWWCP	Seedskadee NWR list	Documented	
													BREEDING	MIGRATORY
NSS 3	II		**Caspian Tern**	Wetlands	Lakes, Rivers					x		X		X
NSS 3	II		**Forster's Tern**	Wetlands	Lakes		X	I			X	X		X
NSS 3	II		**Franklin's Gull**	Wetlands	Lakes		X	I		X	X			X
NSS 3	II		**Harlequin Duck**	Streams	Lakes, Rivers			II						X
NSS 3	II		**Lesser Scaup**	Lakes, Rivers	Wetlands							X	X	X
NSS 3	II	BCC	**Long-billed Curlew**	Shrub-steppe, grasslands	Mudflats	X		X	X			X	X	X
NSS 3	II		**Northern Pintail**	Lakes, Rivers	Wetlands							X	X	X
NSS 3	II	BCC	**Peregrine Falcon**	Wetlands	Riparian			X				X	X	X
NSS 3	II		**Redhead**	Lakes, Rivers	Wetlands							X	X	X
NSS 3	II		**Virginia Rail**	Wetlands								X	X	X
NSS 3	II		**White-faced Ibis**	Wetlands						X		X		X
NSS 4	II		**Brewer's Sparrow**	Shrub-steppe		X	X	X				X	X	X
NSS 4	II	BCC	**Sage Sparrow**	Shrub-steppe			X	X				X	X	X
NSS 4	II		**Sage Thrasher**	Shrub-steppe			X	X				X	X	X

Table 3 (Continued)

Native Species Status	Priority Tier	USFWS ESA or BCC	SPECIES	PRIMARY HABITAT	SECONDARY HABITAT	NAWCA - BCR10	PIF – PA86	PIF - WY	IWSCP	NAWCP	IWWCP	Seedskadee NWR list	Documented	
													BREEDING	MIGRATORY
NSS 4	II		**Short-eared Owl**	Wet Meadows	Riparian			X				X	X	X
NSS U	II		**Clark's Grebe**	Lakes	Wetlands			X				X		X
NSS U	II	BCC	**Lewis's Woodpecker**	Riparian	Coniferous	X	X	X				X	X	X
NSS U	II	BCC	**Swainson's Hawk**	Riparian	Shrub-steppe	X	X	X				X	X	X
NSS 4	III		**Greater Sandhill Crane**	Wetlands	Shrub-steppe						X	X	X	X
NSS 4	III	BCC	**Willow Flycatcher**	Riparian		X		X				X	X	X
NSS U	III		**Merlin**	Riparian				X				X		
NSS U	III	Can.	**Yellow-billed Cuckoo**	Riparian		X		X				X		X

For Table Codes: see next page.

NSS: Native Species Status, Wyoming State Wildlife Action Plan (SWAP)
Priority Tier: Conservation Priority, Wyoming State Wildlife Action Plan (SWAP): I = highest; II = moderate; III = lower.
USFWS: Can. = Candidate for Threatened or Endangered Species status; BCC = Birds of Conservation Concern in BCR 10
NAWCA - BCR10: Priority bird species in Bird Conservation Region 10 as identified by North American Wetland Conservation Act.
PIF – PA64: Partners in Flight North America Physiographic Area 64 Level 1 Priority Species
PIF WY: Wyoming Partners in Flight Bird Conservation Plan
IWSCP: Intermountain West Shorebird Conservation Plan
NAWCP: North American Waterbird Conservation Plan
IWWCP: Intermountain West Waterbird Conservation Plan

TABLE 4. MAMMAL SPECIES OF GREATEST CONSERVATION NEED (SGCN) ASSOCIATED WITH WETLAND, RIPARIAN OR AQUATIC HABITATS IN THE GREEN RIVER BASIN CORE WETLAND COMPLEX (WGFD 2010).

NATIVE SPECIES STATUS	PRIORITY TIER	SPECIES	PRIMARY HABITAT	SECONDARY HABITAT	DOCUMENTED IN PROJECT AREA
NSS2	II	**Long-eared Myotis**	Coniferous Forest	Riparian, shrub-steppe, aquatic	Breeding
NSS2	II	**Long-legged Myotis**	Coniferous Forest	Riparian, aquatic	Breeding
NSS3	II	**Pygmy Rabbit**	Shrub steppe	Riparian	Breeding
NSS4	II	**Moose**	Riparian, coniferous forest	Wetlands, shrub-steppe	Breeding
NSS4	II	**Big Brown Bat**	Coniferous-deciduous forest	Riparian, aquatic	Breeding
NSS4	II	**Little Brown Myotis**	Riparian	Shrub-steppe, aquatic	Breeding
NSS4	II	**Olive-backed Pocket Mouse**	Shrub steppe		Breeding
NSS3	II	**Western Small-footed Myotis**	Shortgrass prairie	Riverbanks, aquatic	Observed
NSSU	II	**Northern River Otter**	Riparian	Wetlands	Breeding
NSS#	III	**Pallid Bat**	Shrub steppe	Riparian	Breeding
NSS3	III	**Vagrant Shrew**	Riparian	Shrub-steppe	Breeding

TABLE 5. WATERFOWL, WATERBIRDS AND SHOREBIRDS IN THE GREEN RIVER BASIN CORE WETLAND COMPLEX AND THEIR STATUS IN VARIOUS CONSERVATION PLANS.

WGF SGCN - NSS	Priority Tier	USFWS	Species	NAWMP - WCR10	NAWCA - BCR10	PIF - PA64	PIF – WY	No. Rockies NAWCP	IWWCP - BCR10	ABC/Audubon Watchlist	Seedskadee NWR Present	Breeding	Migratory
			WATERFOWL										
			Tundra Swan								X		x
NSS 2	II		**Trumpeter Swan**	High		X	I			X	X	x	x
			Ross's Goose								X		
			Snow Goose								X		x
			Canada Goose	Mod Low							X	x	x
			Wood Duck	Moderate							X	x	x
			Green-winged Teal	Moderate							X	x	x
			Mallard	High							X	x	x
NSS 3	II		**Northern Pintail**	High							X	x	x
			Blue-winged Teal								X	x	x
			Cinnamon Teal	Mod High							X	x	x
			Northern Shoveler	Moderate							X	x	x
			Gadwall	Moderate							X	x	x
			American Wigeon	Mod High							X	x	x
NSS 3	II		**Canvasback**	Mod High							X	x	x
NSS 3	II		**Redhead**	Mod High							X	?	x
			Ring-necked Duck	Moderate							X	x	x
NSS	II		**Lesser Scaup**	High							X	x	x

WGF SGCN - NSS	Priority Tier	USFWS	Species	NAWMP - WCR10	NAWCA - BCR10	PIF - PA64	PIF – WY	No. Rockies NAWCP	IWWCP - BCR10	ABC/Audubon Watchlist	Seedskadee NWR Present	Breeding	Migratory
3													
NSS 3	II		**Harlequin Duck**	Moderate			II				X	x	x
			Common Goldeneye	Mod High							X	x	x
NSS 3	II		**Barrow's Goldeneye**	Moderate		X					X	x	x
			Bufflehead	Moderate							X	x	x
			Hooded Merganser	Mod Low							X	x	x
			Common Merganser								X	x	x
			Red-breasted Merganser								X		x
			Ruddy Duck								X	x	x

			WATERBIRDS & SHOREBIRDS										
NSS 1	I		**Common Loon**				II			High		x		x
			Pied-billed Grebe							Mod		x	x	x
			Horned Grebe							Low		x		x
			Eared Grebe							Low		x	x	x
			Western Grebe				III		Mod	Mod		x		x
NSS 4	II		**Clark's Grebe**				III		Low	Mod	X	x		x
			American White Pelican			X	II		Mod	High		x		x

WGF SGCN - NSS	Priority Tier	USFWS	Species	NAWMP - WCR10	NAWCA - BCR10	PIF - PA64	PIF – WY	IWSCP – No. Rockies	NAWCP	IWWCP - BCR10	ABC/Audubon Watchlist	Seedskadee NWR Present	Breeding	Migratory
			Double-crested Cormorant									x		x
NSS 3	II	BC C	**American Bittern**				I			Mod		x		x
			Great Blue Heron							Mod		x	x	x
NSS 3	II		**Black-crowned Night Heron**						Mod	Mod		x		x
			Great Egret									x		
			Snowy Egret							Mod		x		x
NSS 3	II		**White-faced Ibis**						Low	Mod		x		x
NSS 3	II		**Virginia Rail**							Mod		x	x	x
			Sora							Mod		x	x	x
			American Coot									x	x	x
NSS 3			**Greater Sandhill Crane**							Mod		x	x	x
			Black-bellied Plover									x		x
			Semipalmated Plover									x		x
			Killdeer					2				x	x	x
			Black-necked stilt					3				x		x
			American Avocet				III	3				x		x
			Greater Yellowlegs					3				x		x
			Lesser Yellowlegs					2				x		x
			Solitary Sandpiper					2				x		x
			Willet				III	3				x	x	x

WGF SGCN - NSS	Priority Tier	USFWS	Species	NAWMP - WCR10	NAWCA - BCR10	PIF - PA64	PIF – WY	IWSCP – No. Rockies	NAWCP	IWWCP - BCR10	ABC/Audubon Watchlist	Seedskadee NWR Present	Breeding	Migratory
			Spotted Sandpiper					3				x	x	x
NSS 3	II	BC C	**Long-billed Curlew**		X		I	4			X	x	x	x
			Marbled Godwit								X	x		x
			Sanderling								X			x
			Semipalmated Sandpiper								X	x		x
			Western Sandpiper					2			X	x		x
			Least Sandpiper					2				x		x
			Baird's Sandpiper									x		x
			Pectoral Sandpiper									x		x
			Stilt Sandpiper									x		x
			Long-billed Dowitcher					2				x		x
			Wilson's Snipe					3				x	x	x
			Wilson's Phalarope				I	3			X	x	x	x
			Red-necked Phalarope									x		x
NSS 3	II		**Franklin's Gull**			X	I		Mod	High		x		x
			Bonaparte's Gull									x		x
			Ring-billed Gull									x		x
			California Gull						Mod	Mod		x		x
NSS 3	II		**Caspian Tern**						Low	Low		x		x

WGF SGCN - NSS	Priority Tier	USFWS	Species	NAWMP - WCR10	NAWCA - BCR10	PIF - PA64	PIF – WY	IWSCP – No. Rockies	NAWCP	IWWCP - BCR10	ABC/Audubon Watchlist	Seedskadee NWR Present	Breeding	Migratory
			Common Tern						Low			x		x
NSS 3	II		**Forster's Tern**				I		Mod	Mod		x		x
NSS 3	II		**Black Tern**				I	I	Mod	Mod		x		x

*abundance codes are based on likelihood of observing these species rather than actual numbers

Key to Abbreviations

NSS: Native Species Status, Wyoming State Wildlife Action Plan (SWAP)
Priority Tier: Conservation Priority, Wyoming State Wildlife Action Plan (SWAP): I = highest; II = moderate; III = lower.
USFWS: Can. = Candidate for Threatened or Endangered Species status; BCC = Birds of Conservation Concern
NAWMP - WCR10: North American Waterfowl Management Plan priority species
NAWCA - BCR10: Priority bird species in Bird Conservation Region 10 as identified by the North American Wetland Conservation Act.
PIF – PA64: Partners in Flight North America Physiographic Area 64 Level 1 Priority Species
PIF - WY: Wyoming Partners in Flight Bird Conservation Plan: I = conservation action, II = monitoring, II = local interest.
IWSCP – No. Rockies: Intermountain West Shorebird Conservation Plan priority birds in Northern Rockies region; 4 = very important, 3 = important, 2 = slightly important.
NAWCP: North American Waterbird Conservation Plan
IWWCP: Intermountain West Waterbird Conservation Plan
ABC/Audubon Watchlist 2007

Trumpeter Swan: Trumpeter swans were nearly extirpated by the early 20th century. Only 60 to 70 resident birds were thought to persist in the Yellowstone region of Wyoming, Idaho and Montana by the 1930s. Through a concerted conservation effort, about 500 were restored to the Tri-state Area by the 1950s, but numbers declined and fluctuated in subsequent years. Resident trumpeter swans in Wyoming belong to the Tri-state Flock of the Rocky Mountain Population, and are managed through the Pacific Flyway (Subcommittee on Rocky Mountain Trumpeter Swans 2012). The first North American management plan for trumpeter swan included a goal to increase the species' summer and winter distribution beyond the Greater Yellowstone area (USFWS 1984). In response, the WGFD began a range expansion program to establish 10 nesting pairs in the Green River Basin (Appendix 1, Patla and Oakleaf 2004). The USFWS relocated mostly adult wild swans from Montana and Idaho to the Green River drainage in summer (n=25) and winter (n=57) of 1992-1993, but only 2-3 wild swans remained in subsequent years. A resident nesting population was eventually established through the release of 75 captive-bred cygnets and yearlings from 1994-2002 (swans were provided by the Wyoming Wetlands Society in Jackson, WY). Population growth has continued without supplemental releases in recent years, prompting WGFD and partners to restore and create additional summer habitat for this species (Lockman 2005). In contrast, the resident swan population in the Snake River core has declined slightly (Patla 2012). During winter, a major influx of swans from interior Canada increases Wyoming's swan population by up to 10-fold. The number of wintering swans has continued increase over the past 20 years (Subcommittee on Rocky Mountain Trumpeter Swans 2012). The only substantial habitat available for swans wintering in the Green River drainage is the stretch of open water below Fontenelle Dam, where numbers have increased to nearly 200 in recent years (Patla 2012). About 12-24 swans also winter along Forty Rod Creek near the WGFD Daniel Fish Hatchery and the confluence with the Green River. Important summer habitat includes shallow marshes, ponds, lakes, river oxbows, and slow-moving creeks (WGF 2010). In 2012, 25 pairs nested in the GRBWC, including 8 at Seedskadee NWR, 4 on the Bridger-Teton National Forest (BTNF), 1 on BLM lands, and 12 on private lands (Patla 2012).

Issues potentially affecting swans in Wyoming include limited nesting and wintering habitat, long-term drought, collisions with power lines, illegal shooting, competition with an increasing number of migrant swans during winter, increasing human recreation activity, habitat loss and fragmentation, and low recruitment of subadults into the nesting population (WGFD 2010, USFWS 2012a).

Waterbirds & Shorebirds

At least 49 species of waterbirds and shorebirds have been recorded in the GRBWC (Table 4), including 13 species documented as breeding (WGFD 2012). SGCN include: common loon (*Gavia immer)*, American bittern (*Botaurus lentiginosus)*, black-crowned night-heron (*Nycticorax nycticorax)*, white-faced ibis (*Plegadis chihi)*, Virginia rail (*Rallus limicola)*, long- billed curlew (*Numenius americanus)*, Franklin's gull (*Leucophaeus pipixcan)*, Caspian tern (*Hydroprogne caspi),*, Forster's tern (*Sterna forsteri)*, black tern (*Chlidonias niger)*, Clark's grebe (*Aechmorphorus clarkii)* and greater sandhill crane (*Grus canadensis)* (WGF 2010).

Important habitats for waterbirds and shorebirds include marshes, shallow wetlands, lake margins, and seasonal mudflats. Large numbers of grebes, pelicans and loons concentrate on the deeper waters of Fontenelle Reservoir. Seasonal mudflats created by reservoir drawdowns in fall create foraging and loafing habitat for many shorebirds (WGFD records).

Long-billed curlews and greater sandhill cranes breed in the GRBWC (WGFD 2012). Both nest in moist grasslands – the curlew in grassy meadows near water, and the crane in shallow wetlands usually with water surrounding the nest. Cranes also nest in small meadows in the upland forest areas. Based on data from established survey transects, the GBRWC supports the highest density of nesting curlews in Wyoming (Cudworth and Orabona 2011). The American Bittern is rarely observed except at Seedskadee NWR (SNWR records).

Partners in Flight has listed 10 waterbird and shorebird species as priority species for wetland, plains/basin riparian, montane riparian, and meadow riparian habitats (WGFD 2003) in the Green River Basin. Priority species were ranked based on a combination of 7 criteria with Level I species clearly needing conservation action and Level II species needing additional monitoring. Level III species are not high priority, but of local interest for monitoring attention or other conservation management actions.

- Level I – American Bittern, Wilson's Phalarope (*Phalaropus tricolor)*, Franklin's Gull, Forster's Tern, Black Tern
- Level II –Common Loon
- Level III – Western Grebe (*Aechmorphorus occidentalis)*, Clark's Grebe, American Avocet (*Recurvirostra americana)*, Willet (*Triga semipalmata)*

Landbirds

Riparian and wetland habitats sustain the highest diversities and densities of landbirds throughout the arid West. Species groups include grouse, woodpeckers, hummingbirds, swallows, swifts and songbirds. Many are Neotropical migrants that winter in Mexico, Central or South America. Riparian woodlands and willow bottoms provide critical nesting and foraging habitat for dozens of species during the breeding season (Wyoming Partners in Flight 2002). In late summer and early fall, many species associated with upland habitats or higher elevations move into riparian habitats to forage before and during migration. Riparian woodlands with complex understory and overstory layers provide nest sites and foraging opportunities, and mature trees and snags provide cavity sites for nesting and roosting. Willow bottoms and the cattail and reed beds of marshes support differing assemblages of nesting birds. Best management practices to protect and enhance these habitats have been developed by Wyoming Partners in Flight (2002).

Three landbirds that rely on riparian or wetland habitats are classified as Species of Greatest Conservation Need (SGCN): Lewis's Woodpecker (*Melanerpes lewis*), Willow Flycatcher (*Empidonax traillii)*, and Yellow-billed Cuckoo (*Coccyzus americanus)* (WGF 2010). The western distinct population segment of Yellow-billed Cuckoo is also proposed for listing as a threatened species under the ESA. Lewis's Woodpecker and

Willow Flycatcher breed in the GRBWC. Yellow-billed Cuckoo is a rarely occurring species (Seedskadee NWR records).

Wyoming Partners in Flight has identified 18 landbirds as priority species for wetland, plains/basin riparian, montane riparian, meadow riparian habitats in the Green River basin (WGFD 2003):

- Level I –Bald Eagle, Swainson's Hawk, Short-eared Owl,
- Level II – Yellow-billed Cuckoo, Calliope Hummingbird (*Selasphorus calliope*), Black-chinned Hummingbird (*Archilochus alexandri)*, Broad-tailed Hummingbird (*Selasphorus platycercus)*, Lewis's Woodpecker, Willow Flycatcher, Hammond's Flycatcher (*Empidonax hammondii)*, Cordilleran Flycatcher (*Empidonax occidentalis)*, Marsh Wren (*Cistothorus palustris)*, American Dipper (*Cinclus mexicanus)*, and McGillivray's Warbler (*Geothlypis tolmiei)*;
- Level III – Northern Harrier (*Circus cyaneus*,) Northern Rough-winged Swallow (*Stelgidopteryx serripennis)*, Lazuli Bunting (*Passerina amoena*) and Bullock's oriole (*Icterus bullockii)*.

Greater Sage-Grouse: Although the greater sage-grouse is an obligate of sagebrush steppe habitat, we include it in this plan because of the importance of wet depressions, seeps, springs and moist grasslands for brood rearing. In summer, adults and broods forage for forbs and insects in moist sites, including wet meadows and riparian habitats immediately adjacent to sagebrush (WGFD 2010, Paige 1998).

Sage-grouse have been in long term decline and are proposed for listing as a threatened species under the ESA. The species remains relatively common in Wyoming where much of the core habitat and core populations persist. The GRBWC is among the species' strongholds in the Western US. Over 80 active leks have been documented in the Upper Green River basin conservation area and 232 in the Southwest WY conservation area (WGFD Sage-Grouse Working Group Conservation Plans: see http://wgfd.wyo.gov/web2011/wildlife-1000382.aspx#). Through cooperative, landscape-scale conservation efforts, agencies, NGOs, and landowners are endeavoring to prevent the need for listing this species.

MAMMALS

Moose: The moose (*Alces alces*), is a relatively recent immigrant from Idaho and Montana: there is no archaeological evidence of moose occurring in Wyoming prior to the 19th century. Moose frequent willow-dominated and other deciduous riparian habitats, often adjacent to conifer stands. Moose in the Upper Green River basin generally rely on mid- to upper-elevation conifer forests during spring, summer and fall, and move to lower elevation riparian habitats, including areas within subdivisions, in winter (TSS 2008, WGF 2010).

The moose population in the Pinedale region has been modestly increasing whereas moose are

declining in many other portions of the state. The WGFD has established a mid-winter trend count objective of 1,200 (±20%) for the Sublette Moose Herd. Potential threats include declining habitat condition, predation, parasites and disease (WGFD annual Report 2012 – available online at http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/JCR_BGPINE_MOOSE_20120004506.pdf).

Northern River Otter: The river otter (*Lontra canadensis*) inhabits riverine and wetland habitats throughout much of western Wyoming. Historically the species was extirpated from most of Wyoming, but has re-colonized much of its former range. Due to a lack of status information and statewide inventories, the WGFD reclassified otters as Native Species Status Unknown (NSSU). The river otter occupies lakes, streams and other aquatic habitats within riparian cottonwood, shrub and willow communities. Otters are closely associated with bog lakes, beaver lodges and banks with semi-aquatic mammal burrows. Habitat alteration and contamination of aquatic systems are concerns (WGFD 2010). Meran Ben-David of the University of Wyoming is conducting research on the otter population along the Green River and its tributaries, which will produce estimates of abundance and survival, and a long-term monitoring protocol for the species (Ben David 2011).

Beaver: Although not classified as a species of conservation concern, beaver (*Castor canadensis*) can be instrumental in wetland and riparian conservation efforts. Beaver serve a fundamental role in the creation, maintenance, and dynamics of wetland and riparian habitats, particularly in Wyoming's arid landscapes. Beaver dams and resulting ponds broaden stream floodplains, raise the water table, trap sediments, improve water quality and encourage growth of riparian vegetation. Beaver ponds also slow surface water and store large amounts of water in the surrounding water table, which helps maintain year-round streamflow and prolongs late season flows in small streams. Beaver ponds and wetlands provide important habitat for waterfowl, native fish, amphibians and aquatic mammals. Beaver activity enhances willow and other riparian vegetation that provides essential habitats for breeding and migrating birds, and greatly increases bird diversity and abundance (WGFD 2010).

Once abundant, beaver were largely trapped out of the Green River watershed and elsewhere for the fur trade in the early 19th century. Through concerted conservation efforts in the 20th century, the species has returned to many watersheds throughout the state. The historic reduction in beaver distribution altered stream and upland ecology by greatly reducing the extent of beaver-created wetlands. This changed the entire stream and floodplain dynamic resulting in higher peak flows of shorter duration, channel down cutting and bank erosion, desiccation of riparian habitats, and reduction or loss of sustained flows. Beavers have reoccupied most of their historic range, but at only approximately 10% of the pre–European contact densities (Naiman et al. 1988, WGF 2010). The Wyoming State Wildlife Action Plan (WGF 2010) encourages beaver reintroductions to restore stream and riparian habitats where it will not cause conflicts due to unwanted flooding and tree damage.

REPTILES AND AMPHIBIANS

Amphibians are an indicator of riparian and wetland health. They also serve an important role in terrestrial and aquatic food webs. Several reptile and amphibian SGCN that use wetlands and riparian areas within the GRBWC include: boreal toad (*Anaxyrus boreas boreas)*, northern leopard frog (*Lithobates pipiens)*, Great Basin spadefoot (*Spea intermontana*), Great Basin gophersnake (*Pituophis catenifer deserticola*), greater short-horned Lizard (*Phrynosoma hernandesi hernandesi)* and northern many-lined skink (*Plestiodon multivirgatus multivirgatus*) (WGF 2010). Tiger salamanders (*Ambystoma tigrinum*) occur throughout the area as well. Surveys to monitor the species have been conducted at Seedskadee NWR and by WGFD. Threats to amphibians include the disease chytridiomycosis, chemical contaminants such as pesticides, UV-radiation, invasive species, roads and developments and drought (Pilliod and Wind 2008). Conservation actions recommended for these SGCN species can be found in the individual species accounts in the WGFD State Wildlife Action Plan (2010).

AQUATIC WILDLIFE

Fish: The following basin management plans cover the GRBWC: Middle Green River (7GM) and Lower Green River (7GL) plans, and sections of the Cottonwood Creek (7CO), Piney Creek (7PC), and LaBarge Creek (7LA) plans (WGFD 2009). Nineteen species of fish are found in the GRBWC. SGCN include: Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus)*, Bonneville cutthroat trout (*Oncorhynchus clarkia utah)*, bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), roundtail chub (*Gila robusta*), and mountain whitefish (*Prosopium williamsoni*) (WGF 2010). Maintaining or enhancing sport-fishing opportunities is the primary management goal for much of the basin. WGFD is a signatory of a range-wide conservation agreement for roundtail chub, bluehead sucker, and flannelmouth sucker. WGFD has also developed a "Conservation Strategy for Colorado River Cutthroat Trout" with the states of Colorado and Utah.

WETLAND CONSERVATION PLANS & INITIATIVES

Several plans and initiatives address wetland conservation directly or indirectly, at regional or statewide scales, in Wyoming. The Wyoming Wetlands Conservation Strategy (WJVSC 2010) is a good source of information about state-wide wetland regulations, plans and initiatives: http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/HABITAT_WYWETLANDSCONSERVATION0000332.pdf.

Following is a brief summary of relevant conservation plans and initiatives that may provide useful information for planning wetland projects within the Green River wetland complex area. Website links are provided where available.

Wyoming Water Development Commission – Green River Basin Plan

The 1999 Wyoming Legislature authorized the Wyoming Water Development Commission (WWDC) to complete the Green River Basin Water Plan (States West 2001). The plan was updated in 2010 (WWG Engineering 2010: http://waterplan.state.wy.us/plan/green/green-plan.html). Estimates of future water demand in the basin are based on low, moderate, and high growth scenarios and opportunities for water projects. The plan contains limited information about wetland and riparian resources. The updated version of the plan includes climate data depicting a general, basin-wide decrease in annual precipitation after the year 2000. The WWDC is currently preparing a more detailed watershed study in partnership with the Sublette County Conservation District. The objective is to inventory, describe and map the Upper Green River watershed north of Fontenelle Reservoir based on existing sources of data and information. The study will also identify possible projects on private lands such as stock pond rehabilitation, new wells/tanks, and water diversion structures.

Bureau of Land Management – Resource Management Plan

As noted, most of the GRBWC is within the area covered by the Pinedale Area Resource Management Plan (RMP). This RMP addresses management of BLM-administered public lands and minerals. The revised RMP provides detailed information on land uses and natural resources (including riparian habitat), and lists agency planning objectives for those resources (USDA BLM 2008): http://www.blm.gov/wy/st/en/programs/Planning/rmps/pinedale/rod_armp.html.

Bridger-Teton National Forest-Land and Resource Management Plan

A comparatively small portion of the Green River Basin wetland complex is within the Bridger-Teton National Forest (BTNF). However, forest management activities can significantly affect wetlands and riparian areas throughout the valley. The forest stores the majority of the snowpack and water that sustains wetland and riparian resources downstream. The 1990 BTNF Land Resource Management Plan states that current water quality conditions are “pristine” (USDA BTNF 1990). Forest activities that potentially impact water quality include livestock grazing, timber harvest, oil & gas development, recreation and road building. The forest plan includes management prescriptions for riparian areas, wetlands and floodplains. These prescriptions focus primarily on reducing impairments to stream conditions and water quality.

A recent 5-year monitoring report concluded forest activities have impacted the extent and proper functioning condition of riparian habitats in certain areas (USDA BTNF 2009). Harmful activities include road construction, user accelerated erosion from road and trails, dispersed campsites, and livestock grazing. Many impaired areas are responding to improved management in recent years, while others continue to be degraded. Additional impacts riparian areas arise from changes in occupancy by beavers, big game feed grounds located within or near riparian areas, and changes in natural disturbance regimes which can alter riparian characteristics (e.g., expansion of conifers into riparian areas due to fire suppression).

Wyoming Game and Fish Department – Habitat Priority Areas

Goal 1 identified in WGFD's 2009 Strategic Habitat Plan is "*Conserve and manage wildlife habitats that are crucial for maintaining terrestrial and aquatic wildlife populations for the present and future.*" Priority habitats essential to implement Goal 1 are identified. The Strategic Habitat Plan also identifies degraded habitats with potential for restoration and enhancement (WGFD 2009). Most of the GRBWC area falls within priority habitat areas (Fig. 6). Details and maps of priority areas in the Pinedale Region are available at: http://wgfd.wyo.gov/web2011/wildlife-1000556.aspx. The web link for the WGFD 2011 Pinedale Region annual report, which summarizes ongoing and recently completed conservation work, is: http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SHP11_AR_PINEDALEREGION0002327.pdf.

Trumpeter Swan Summer Habitat Enhancement Project, Wyoming Game and Fish Department Nongame Program (Susan Patla, project coordinator)

WGFD received a State Wildlife Grant in 2003 to plan habitat enhancement projects for trumpeter swan range expansion in the Green River Basin. Objectives were: 1) identify and survey potential summer habitat; 2) develop preliminary plans for priority wetland projects, and 3) identify partners to fund high priority projects. A list of potential project sites was developed based on knowledge of swan movements and contacts with willing landowners. The Department hired a contractor (Dave Lockman) to collect baseline data and prepare site-specific plans for 20 shallow water pond projects on 13 private ranches. High priority projects were selected at 14 sites. Through 2012, over 40 acres of shallow water wetland habitat had been created or enhanced on 5 ranches. Plans were cancelled at six other locations due to insufficient/undependable water sources or other concerns. Plans for two new ponds have been developed and construction scheduled for 2014. The Wyoming Landscape Conservation Initiative (WLCI) has been a major funding body supporting these wetland projects. Other funding partners include Wyoming Game and Fish Department, Wyoming Wildlife and Natural Resource Trust, Natural Resources Conservation Service, Partners for Fish and Wildlife Program, and Foundation for Fish and Wildlife.

Wyoming Landscape Conservation Initiative (WLCI)

The WLCI is a science-based collaborative program that was established to assess and enhance aquatic and terrestrial habitats while facilitating responsible development throughout southwest Wyoming. The executive committee includes BLM, US Geological Survey (USGS), US Fish and Wildlife Service (FWS), WGFD, WY Department of Agriculture, SW WY County Commissioners, area Conservation Districts, and the US Forest Service. Each county has a Local Project Development Team that proposes and evaluates projects for funding. Projects focus on 5 key habitat types: aspen, sagebrush, mountain shrub, riparian and aquatic. The objective is to maintain or restore ecological function and health of these habitats. Emphasis is placed on fragmented habitats, invasive species, and water quality and

quantity issues. Funding to support the WLCI came through the Healthy Lands Initiative starting in FY 2008. Information on projects, meetings, and publications can be found at: http://www.wlci.gov. WLCI has helped fund the creation of over 40 acres of shallow wetland habitats for trumpeter swans.

Intermountain West Joint Venture (IMJV)

The IWJV spans 11 western states and is geographically the largest Joint Venture. IWJV is comprised of multi-level partnerships among diverse public and private organizations who share a common interest in the bird conservation in the Intermountain West. The IWJV was initially organized in June 1994 to serve as an implementation arm of the North American Waterfowl Management Plan (NAWMP). Its mission was expanded in 1999 to conserve all bird habitats, though priority habitats are wetlands, sagebrush-steppe, and grasslands (IWJV 2013). The IWJV updated its implementation plan in 2013 based on principles of strategic habitat conservation rooted in bird conservation priorities and habitat objectives with explicit connections to continental bird population objectives. The 2013 implementation plan can be accessed at: http://iwjv.org/resource/iwjv-2013-implementation-plan-entire-plan). This plan includes chapters on waterfowl, shorebirds, waterbirds and landbirds as well as a habitat conservation strategy and strategic communications plan. The Conservation Fund (TCF) received an IWJV capacity grant in 2011 to develop a framework for submission of a NAWCA standard grant for the GRBWC area. The Wyoming Game and Fish Department worked with TCF and other partners to develop a standard NAWCA grant (see below).

Green River Basin Wetland Profile and Condition Assessment, WGFD

This EPA-funded project is the first basin-wide Level 2 wetland assessment completed in Wyoming. Project partners include WGFD, The Nature Conservancy Wyoming, and the University of Wyoming Natural Diversity Database. Objectives were to identify baseline reference wetlands in the Green River Basin; conduct a statistically valid, field-based survey of wetland conditions and habitat values; and assess wetland habitat requirements of target wildlife species. Results will be used to improve information available to government agencies and NGOs to support decisions and funding requests concerning wetland protection and enhancement. Field work was completed in summer 2012 (60 random and reference wetland sites were sampled) and data compilation and input were completed in winter 2012/2013. Data analysis and landscape level modeling of wetland resources will be completed in the winter/spring of 2013/2014 with the final report due by September 29, 2014.

Upper Green River Wyoming North American Conservation Act Standard Grant

USFWS announced on July 19, 2013 that WGFD was awarded a standard NAWCA (North American Wetland Conservation Act) grant of $1 million. This grant, along with match funding from other partners, will secure permanent conservation easements on 14,896 acres of wetlands and 22,734 acres of upland habitat. In addition, 2,422 acres of riparian habitat will be restored and enhanced at Seedskadee National Wildlife Refuge and over 28 acres of wetlands will be restored or created on

private lands. This is the first $1 million standard NAWCA grant awarded exclusively in the state of Wyoming. The Conservation Fund and other partners were instrumental in securing the grant. Work will be completed by July 19, 2015.

Pinedale Anticline Project (PAPA)

The Pinedale Anticline Natural Gas Field covers 198,000 acres, predominantly within sagebrush-steppe habitat on federally-owned lands adjacent to the New Fork River and Green Rivers. The area overlies one of the richest deposits of natural gas in the U.S. Reserves are currently estimated at more than 25 trillion cubic feet. The 2008 Supplementary Environmental Impact Statement established a fund to monitor and mitigate impacts to wildlife, air and other resources. The Pinedale Anticline Project Office (PAPO) was created to oversee on-site monitoring and off-site mitigation activities. The PAPO houses and distributes monitoring information to support the adaptive management process and evaluates effectiveness of mitigation projects primarily focused on mule deer, pronghorn, Greater Sage-grouse and raptors. (Access information at: http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/pfodocs/anticline/rod.Par.50775.File.dat/00ROD.pdf).

Jonah Interagency Office (JIO)

The Jonah Natural Gas Field lies immediately south of the Pinedale Anticline and also overlies one of the richest deposits of natural gas in the U.S., currently estimated at over 14 trillion cubic feet. The field encompasses 30,000 acres of rolling sagebrush habitat that is 94 percent federally owned. The Jonah Interagency Mitigation and Reclamation Office (JIO) was created by the Jonah Project Record of Decision (ROD) to manage on-site monitoring and off-site mitigation activities. EnCana Oil & Gas (USA), Inc. and BP America Production Company committed $24.5 million to fund the monitoring and mitigation program overseen by the JIO. The Jonah Infill Drilling Project ROD represents an innovative, collaborative approach to minimize the footprint of development, maximize recovery of natural gas and speed up the reclamation process. (Access information at: http://www.wy.blm.gov/jio-papo/jio/index.htm).

Wyoming Bird Habitat Conservation Partnership (WBHCP)

The mission of the WBHCP (formerly the Wyoming Joint Ventures Steering Committee) is to facilitate habitat conservation planning and projects to help achieve objectives of priority state, regional and continental bird plans. Its focus is primarily on wetland and riparian conservation. The WBHCP web site provides links to key documents on conservation of wetlands and birds in Wyoming. (See: http://iwjv.org/partner-state/wyoming-state-conservation-partnership).

Partners for Fish and Wildlife Program, Mountain-Prairie Region Strategic Plan 2012-2016

The Partners for Fish and Wildlife (PFW) Program accomplishes habitat restoration and enhancement on private lands through voluntary partnerships and cost-sharing with landowners. The 5-year strategic plan for the Mountain-Prairie Region covers 8 states including Wyoming. The Plan's Upper Green River focus area is more than 1.2 million acres, over half of which is within the wetland complex area identified by the Wyoming Bird Habitat Conservation Partnership. Five-year targets include: 10,000 ft of stream enhancements, 10 mi of riparian habitat enhancements, 80 acres of wetland restoration and enhancement, 2,000 acres of upland habitat enhancements, and 5 fish passage structures. The PFW Strategic Plan is available at: http://www.fws.gov/partners/strategic_plans/regions/fulldocumentjan2708.pdf.

Ducks Unlimited Peaks to Prairies Initiative (2012-2016)

The Peaks to Prairie Initiative was conceived to protect and restore exceptional wetlands in the Rocky Mountain region through a fund raising initiative and by employing strategic public policy solutions. The goal for Wyoming, Montana and Colorado is to generate $3.1 million to fund 3,521 acres of habitat delivery. (See: http://www.ducks.org/conservation/conservation-initiatives/peaks-to-prairies-initiative).

THREATS TO WETLANDS

Threats to wetland function and integrity are described in the Wyoming Wetland Conservation Strategy (WJVSC 2010) and the Wyoming State Wildlife Action Plan (WGFD 2010). A subset of threats considered most significant within the GRBWC (Table 6) was identified in consultation with cooperators, land managers and local residents; and through review of relevant conservation and land management plans. Copeland et al. (2010) assigned Green River Basin wetlands a vulnerability score of 81 (100 being highest).

Table 6. Primary threats in the Green River Basin Wetland Complex.

Threat level / Cause/Source	Low	Moderate	High	Extreme
Climate change/drought				x
Energy/mineral development			x	
Rural residential development			x	
Dam and reservoir construction		x		
Conversions to center pivot irrigation		x		
Overutilization by livestock and wild ungulates		x		
Invasive species	x			

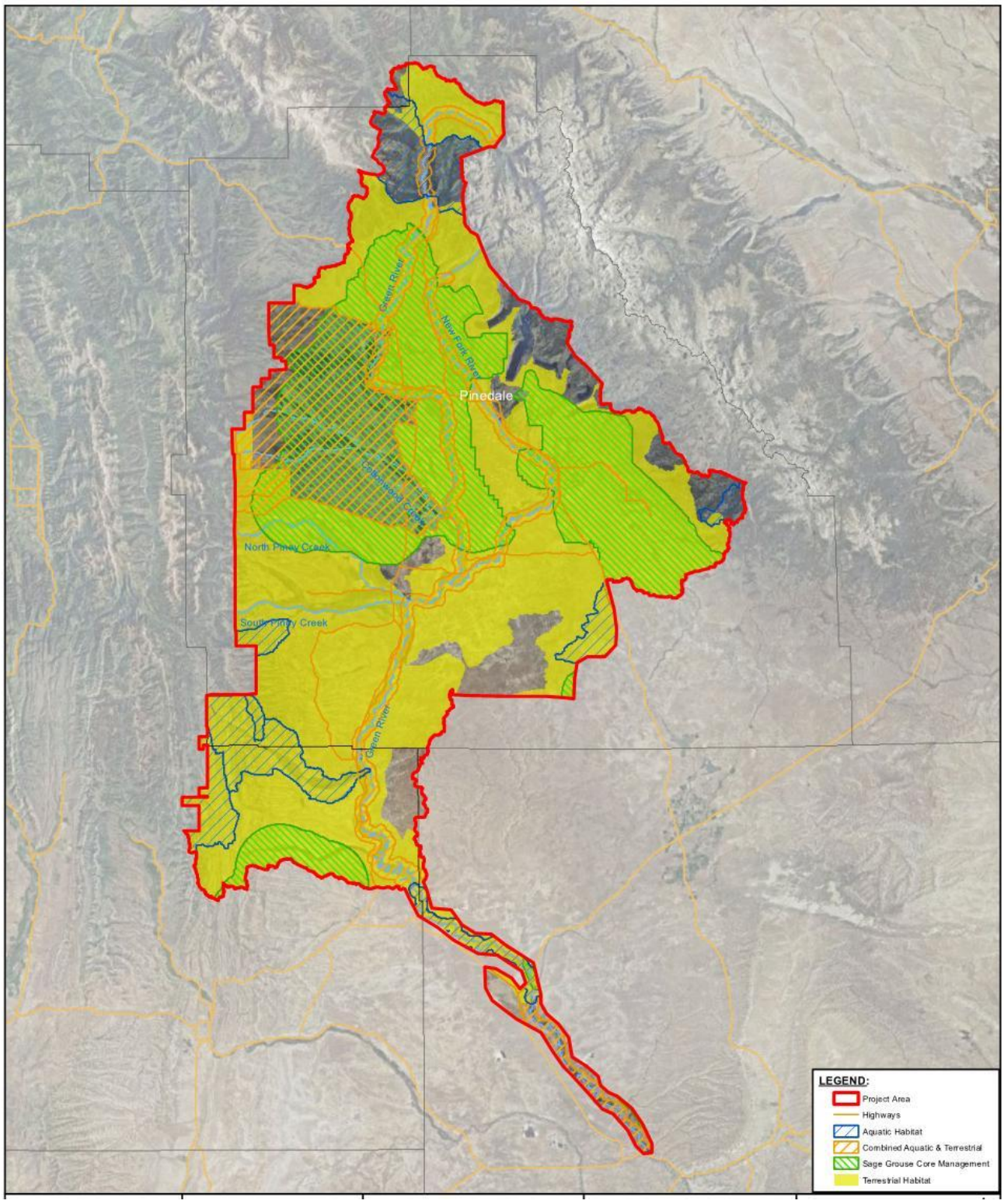

Fig. 6. WGFD priority habitats in the core Green River Wetland Complex area.

Climate Change/Drought

Sublette County was among eight counties the USDA declared drought disaster areas in 2012. Severe drought persisted into 2013. Reservoir levels in February 2013 were 40% of average and many natural springs quit flowing early in the year. Smaller and isolated wetlands, including several in the New Fork Potholes, severely receded or dried up completely. According to the High Plains Regional Climate Center, statewide average temperatures increased 2.7^{o} F in the spring, 2.3^{o} in summer, and 0.6^{o} and 0.8^{o} in fall and winter, respectively. Statewide precipitation was 14% below average during the same period. (Refer to: ttp://www.hprcc.unl.edu/publications/files/HighPlainsClimateChangeGuide.pdf). Higher summer temperatures increased evapotranspiration, resulting in lower soil moisture content. If climatic trends continue as sources predict, Irrigation demands will increase and habitat for wetland dependent wildlife will be severely impacted. Gray and Anderson (2009) provide an assessment of how climate change may affect future water resources in Wyoming.

Energy and Mineral Development

Eenergy and mineral development in the GRBWC has the potential to directly and indirectly impact wetlands and riparian habitats through such factors as water and air pollution, depletion of water resources, loss and fragmentation of habitat due to infrastructure and subdivision development, and associated activities. Sublette County and the Bureau of Land Management track some impacts associated with large field developments (e.g., the Pinedale Anticline and Jonah Projects. Reports are available on the respective web sites. Although the pace of development has slowed since the peak in 2007, energy extraction is expected to continue for many decades in the GRBWC.

Rural Residential Development

Rural residential developments pose a serious threat to wetlands and riparian habitats in the GRBWC because most private land available for disposal is in the lower elevation areas. Over 40% of land in the basin is privately owned and lands adjacent to the major river and stream corridors are most valued for residential development. Although Section 404 of the Clean Water Act continues to protect wetlands that are hydrologically connected to navigable waters, the GRBWC contains many isolated wetlands and riparian habitats that are unprotected and may be filled and cleared without obtaining a permit.

Domestic dogs and cats running loose are a particular threat to wetland dependent wildlife. This type of activity increases within and around residential developments. The county and WGFD are often unaware of domestic pets harassing wildlife on private lands and exercise little control over the problem.

Conversion of flood irrigated hay meadows and pasture to residential developments will directly impact wetlands and riparian habitats associated with seasonally flooded fields and irrigation supply ditches. With the curtailment of irrigation, additional wetlands and riparian habitats may be impacted as the groundwater table lowers, and as return flows and groundwater discharges diminish.

Dam and Reservoir Construction

The Wyoming Water Development Commission has concluded additional water is available to be developed in the Green River Basin and has identified potential reservoir sites (States West 2001, WWG Engineering 2010). Trans-basin diversions are also a possibility under the upper Colorado River Basin Compact. For several years, a Colorado entrepreneur has been worked on a plan to divert water from the Green River 560 miles to Pueblo, CO (see: http://wyofile.com/bill-sniffin/green-river-diversion-plan-a-big-rip-off-of-wyoming/). The proposed diversion sites are downstream from the Upper Green River Wetland Complex, though the project could potentially impact operation of Fontenelle Reservoir. A need for additional storage capacity to meet late season and dry year irrigation needs has also been identified (States West 2001, WWG Engineering 2010). Currently, most of the irrigated lands in the basin derive water from natural flow sources rather than stored water. Current economics do not favor construction of new reservoirs, but if additional financial assistance is made available or if commodity prices rise significantly, this situation could change.

Conversions to Center Pivot Irrigation

Agriculture remains the largest water consumer in the Green River Basin and statewide (States West 2001, WWG Engineering 2010). Flood irrigation is the prevalent method currently used to irrigate in the GRBWC. Momentum to convert to center pivot irrigation systems is driven by two concerns: water conservation and salinity control. Implementation of the Colorado River Basin Salinity Control Program includes installation of center pivot sprinkler systems; replacement of open conveyance ditches with gated pipe; and application of surge values which alter infiltration rates. Participation in the program is voluntary and participants receive a cost share of approximately 30 percent of construction costs. (See: http://waterplan.state.wy.us/BAG/green/briefbook/crsc-pamplet.html). Although these conversions may ultimately increase stream flows, numerous small wetlands sustained by flood irrigation will be lost. In addition, important foraging habitat used by waterfowl in spring and fall will be lost with elimination of flood irrigation from agricultural fields.

Overutilization by Livestock and Wild Ungulates

Overutilization of riparian areas can inhibit cottonwood and willow regeneration and adversely affect vegetation composition and structure, water quality, stream morphology, fisheries habitat, and overall wildlife diversity and abundance. Grazing within wetlands can eliminate cover, damage root mats, trample nests, and increase nest predation rates (WGFD 2010).

Invasive Species

Numbers of invasive species in Sublette and Sweetwater Counties (139 and 131 respectively) are among the lowest documented in Wyoming counties (see: http://www.eddmaps.org/tools/statereport.cfm?id=us_wy). A good introduction to the status of invasive plants in Sublette County is available at: http://www.wy.blm.gov/jio-papo/jio/presentations/reclamationwkshp07/Peterson.pdf. Invasive plants of particular concern within GRBWC wetlands and riparian habitats include perennial pepperweed (*Lepidium latifolium*), spotted knapweed (*Centaurea maculosa*), and saltceder (*Tamarix* L.).

WETLAND CONSERVATION OBJECTIVES

Although profound changes have occurred in the Green River Basin since the 1800s and the rate of change continues to accelerate, the basin still contains outstanding wetland and riparian habitats. The following objectives are recommended to conserve and manage wetlands and riparian habitat within the GRBWC:

1) Strive for a no net loss of wetlands in the Green River Basin Wetland Complex with a focus on preserving remaining high quality wetlands and riparian habitats.
2) Continue to obtain conservation easements to protect important wetlands and riparian areas potentially vulnerable to future development, especially along major rivers and stream corridors.
3) Strive to improve existing maps of wetland habitat and use the most current data to identify and prioritize wetland sites for conservation, enhancement and restoration.
4) Secure additional funding to support ongoing and future wetlands conservation and enhancement through IMJV, WLCI, USFWS, NRCS, TNC, DU, WWNRT, WGFD, BLM, USFS and other partners.
5) Maintain and expand existing agency and NGO programs staffed with full-time positions that focus on wetland conservation and enhancement. Building relationships with the public is essential for project development on private lands.
6) Work with local, state and federal government agencies to direct energy development outside of wetland and riparian areas, and to require restoration of sites that have been affected by past development.

7) Compile data on the benefits of traditional flood irrigation for wetlands and wildlife, and work with county, state and federal agencies in the development of future management policies that affect water use and delivery for agricultural needs
8) Implement wetland and watershed "best management practices" to improve water quality and sustain/enhance wetland functions and values throughout the Green River Basin Wetland Complex.
9) Provide additional public access opportunities for wetland-dependent recreation such as waterfowl hunting and wildlife viewing.

WETLAND CONSERVATION STRATEGIES

The following conservation strategies should be implemented as possible to address the conservation objectives identified above.

A. Identify and prioritize important wetland resources.
   - Complete Green River Basin Wetland Profile and Condition Assessment (WGFD and TNC).
   - Obtain results from the Green River Basin Wyoming Water Development Commission watershed update.
   - Complete an assessment of wetlands that support nesting trumpeter swans.
   - Compile and map new information to identify types and locations of high priority wetlands and develop a prioritized list of potential projects.

B. Implement actions to protect and maintain high priority wetland habitats.
   - When possible, acquire additional conservation easements focusing on agricultural lands along major river and stream drainages.
   - Consider developing multi-year NAWCA grant proposals.
   - Provide recommendations for land management agencies on specific project implementation plans and larger scale land management plans.
   - Implement and monitor livestock best management practices.
   - Support state and federal legislation that strengthens and funds wetland conservation measures.
   - Encourage creation of productive shallow water wetlands capable of providing habitat for waterfowl and amphibians where appropriate (Patla and Lockman 2004).

C. Utilize available funding sources for wetland protection, restoration and enhancement.
   - Work with land trusts and conservation easement funding organizations including Pinedale Anticline Project and Jonah Interagency Office.
   - Promote the mitigation bank concept on county and state level.

- Apply for federal funding through USDA Wetlands Reserve Program, USDA Farm and Ranch Protection Program, North American Wetlands Conservation Act (NAWCA) Wyoming Landscape Conservation Initiative (WLCI), USFWS Partners Program.
- Apply for state grants and funding through Wyoming Wildlife and Natural Resource Trust (WWNRT), WGFD Trust Fund, Wyoming Wildlife Foundation.

D. Strengthen local land development regulations.
- Recommend provisions in county and municipal regulations to protect wetlands and riparian habitats through setbacks.
- Provide incentives to shift development rights to lands with lesser wetland and riparian values.
- Consider wetland banking mechanisms.
- Continue working with WGFD to identify wildlife corridors and high value wetland habitat areas.

E. Apply wetland and watershed "best management practices."
- Encourage landowners, agencies and organizations with stewardship responsibilities to implement wetland and watershed "best management practices."
- Provide technical support and assistance, and where appropriate, funding to implement BMPs.
- Disseminate wetland and watershed BMP information through publications, bulletins, web sites, extension services, and one-on-one contacts.
- Useful BMP and wetland design references include: Oneale (1993); Welsch et al. (1995); WY DEQ (1997, 1999, 2004); Brockmann (1999); Interagency Workgroup on Wetland Restoration (2003); Nicholoff (2003); McKinstry et al. (2004); Niemuth, et al. (2004); Patla and Lockman (2004); Tessmann (2004); and USEPA (2005).

F. Provide Effective Mitigation for Impacts to Wetlands and Riparian Habitats.
- Work with the Pinedale Anticline Project and Jonah Interagency Office to develop effective mitigation for impacts resulting from large-scale energy developments.
- Rely on the most current wetland data, land management and wildlife conservation plans, and guidance from experts to identify suitable locations for mitigation.
- Encourage onsite mitigation as the highest priority to replace lost functions and values.
- Consider offsite mitigation to replace watershed and wetland complex functions and values only where effective onsite mitigation is infeasible, or where there is potential for a significant net gain in habitat value.
- Work with county and local governments to strengthen wetland mitigation requirements in local land management regulations.

G. Stay informed about salinity control and other agricultural programs that may result in

changes to traditional flood irrigation and other agricultural practices; collect information on the value of flood irrigation for wetlands, ground water, waterfowl and other wildlife.

- Develop a list of programs and contacts in Wyoming through NRCS and other agricultural agencies to keep informed about proposed projects
- Develop a database of literature and research to demonstrate the value of traditional irrigation methods, and
- Seek funding and work with landowners to collect monitoring data on wetlands and wildlife use of agricultural lands

F. Increase capacity for more effective implementation of state and federal wetland programs.

- Articulate the need for permanent positions dedicated to wetland resource work in the region. It takes years to build public trust and a network of partners and funding sources to be successful.
- Continue providing input on NRCS and Farm Bill programs at the Washington level to help maintain and increase program funding for wetland conservation.
- Continue working with Ducks Unlimited to develop programs and staff in western Wyoming.

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APPENDIX 1. Timeline of Trumpeter Swan Range Expansion Project Work in the Green River Basin (Wyoming Game and Fish Department)

(Compiled by S. Patla, October 2012, revised April 2013)

1982-1986 WGFD completed a status assessment of swans in WY outside of YNP. Recommendations from this report included the need to evaluate and enhance potential swan summer habitat on private and public lands in the Green River drainage (Lockman et. al. 1987).

1984 The first Pacific Flyway Management Plan for the Rocky Mountain Population of Trumpeter Swans was completed. RMP plan emphasized the need to expand summer and winter distribution and recommended translocation of swans in winter and summer to the Green River basin and other locations from Red Rock Lakes NWR (RRL).

1988 WGFD initiated a swan range expansion project with the goal of establishing 10 nesting pairs of swans in the Green River basin in conjunction with the Flyway RMP range expansion program (Patla and Oakleaf 2003).

1992 WGFD translocated 25 swans in the summer from RRL, and FWS translocated 5 wild swans in summer to Seedskadee NWR, and 57 swans in winter from RRL and Harriman State Park, ID. Translocated swans showed little site fidelity in subsequent years except for a few exceptions (Patla and Oakleaf 2003).

1994-2002 WGFD released a total of 75 captive-bred cygnets and yearlings in the Green River basin (birds provided by Wyoming Wetland Society captive flock in Jackson, WY).

1997 First successful nest at Seedskadee NWR.

2003 Goal of ten nesting pairs achieved in the Green River basin. In 2003-2004 swans fledged 38 cygnets.

2003-2005 Funding was obtained through the new federal State Wildlife Grant Program to complete a habitat planning project to identify and survey potential summer swan habitat on private and public lands in the basin. Management plans were developed for 20 potential pond projects on 12 ranches working with willing landowners (Lockman 2005).

2007 First grants obtained from the newly established BLM Wyoming Landscape Conservation Initiative (WLCI) and the Wyoming Wildlife and Natural Resource Trust (WWNRT) to construct 4 wetland ponds on the Rimfire Ranch, Daniel WY. Ponds were completed in 2008-2009.

2008- 2012 Grants obtained from WLCI, WWNRT, NRCS, and FWS Partners Program to build ponds on the Duck Creek Ranch, Budd Ranch, and Swift Ranch. These ponds were completed in 2009-2011. Planning is currently underway to construct two ponds on the Lazy River Ranch. Over 40 acres of wetlands have been established to date and over $1,000,000 in grant money has been

obtained.

2012 In winter 2012, **230 swans** were counted in the Green River basin (22% of all swans wintering in WY). In fall 2012 **92 adults and 39** cygnets were counted. The fall totals represent 81% of cygnets produced and 64% of adult population in WY outside of YNP. The swan population in the Green River has an exponential growth rate compared to a slightly declining rate in the traditional Snake River area of WY (Patla 2011). The Green River has become a major recovery area for Wyoming and the Tri-state Area Rocky Mountain Trumpeter Swan population.

2013 WGFD, The Conservation Fund and other partners were awarded a standard NAWCA grant for $1 million dollars to help fund conservation easements, riparian restoration at Seedskadee NWR, and wetland projects on two ranches in the upper Green River basin. In addition, WGFD is working with FWS Partners to complete project plans for the WLCI-funded Lazy River Ranch project. Construction of two ponds near Boulder will start in 2014.